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CONTENTS

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IN THIS ISSUE

Calcium is believed to be one of the more prevalent deficiencies in the American diet, but no simple, sensitive test is available for the diagnosis of early or mild manifestations of calcium deficiency. Because of the great importance of adequate or optimal calcium intake for health, as shown by Sherman and others, this lack of a practical diagnostic method for routine examinations is a significant gap in the new science of diagnosis of mild or subacute deficiency states. In an investigation of the nutritional status of several thousand adolescents in New York City, which emphasized the evaluation of various methods which have been suggested for diagnosis of mild deficiencies, a test for the neuromuscular response to galvanic stimuli was included to study its value in detecting mild calcium deficiency. An analysis of this test is presented by Gilbert W. Beebe in the article "Neuromuscular Response to Galvanic Current as a Guide to the Adequacy of Calcium Nutrition of Adolescents" which is the fourteenth in the series on Medical Evaluation of Nutritional Status. Limitations of the data available for an evaluation of the tests are discussed, and the conclusion is reached that this Study furnished no evidence that the neuromuscular response to galvanic stimulation provides a satisfactory basis for appraising calcium nutrition of groups of adolescents.

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The article, "The Frequency of Doctors' Prescriptions and of Laboratory and Related Services in the Treatment of Illness," by Selwyn D. Collins, presents data showing the use of medicines procured by doctor's prescription, by druggist's recommendation, and by purchase over the counter without either of these procedures. The frequency with which laboratory and X-ray services and physiotherapy were used in the diagnosis or treatment of illness is also presented.

Some medicine was procured for 58 per cent of all illnesses reported in the survey of 8,758 white families. The minor respiratory diseases were the most frequent cause for procuring medicine of all the various types; communicable diseases, minor digestive diseases, and accidents were also important among the diseases that lead to the purchase of medicine. The data are shown by sex, by income class, and by size of community.

MEDICAL EVALUATION OF NUTRITIONAL STATUS[1]

XIV. NEUROMUSCULAR RESPONSE TO GALVANIC CURRENT AS A GUIDE TO THE ADEQUACY OF THE CALCIUM NUTRITION OF ADOLESCENTS

GILBERT W. BEEBE

DIET studies (1, 2) have shown that the calcium content of the American diet is very frequently less than the amount needed to provide adequately for bodily requirements for this essential food element. Although it is particularly desirable that calcium deficiency in the body should be discovered in its early or mild state before signs of gross change have become manifest, no reliable, feasible, and routine method of detection has been demonstrated. Sherman (3) has epitomized the problem in these words: "Growing children whose height, weight, and appearance are normal may have a calcium-poor condition of body which even the best physical examination cannot reveal, but which is revealed by the chemical evidence of the calcium balance experiment . . ." Such a procedure is not, however, well adapted to the routine examination of large population groups.

Fully developed clinical manifestations of calcium deficiency or disturbance appear in the nerves, blood, and bone. There has also been a definite trend toward the detection of slight changes in these tissues characteristic of deficiency. Appropriate methods for this purpose have been used diagnostically in clinical practice, but no thorough test has been made of their applicability in surveys of the nutritional status of the population.

Following its development by Erb (4), clinical medicine adopted

[1] This paper is the fourteenth of a series from a cooperative investigation by the Division of Public Health Methods, National Institute of Health, United States Public Health Service; the Cornell University Medical College, Department of Public Health and Preventive Medicine and Department of Pediatrics; the Milbank Memorial Fund; and the New York City Department of Health.

The cooperating agencies were assisted in carrying out this investigation by the Work Projects Administration for the City of New York, Official Project No. 65-1-97-21 W.P. 24, "Medical Evaluation of Nutritional Status."

the method of detecting hyperirritability of the nerves by observation of the neuromuscular response to galvanic stimuli. Erb described the application of the method to adults; Escherich (5) introduced and Thiemich (6) and Mann (7) perfected its use with children. Soon it became limited in its application almost entirely to the diagnosis of tetany in infants. Long before the cause of tetany was known, Erb differentiated the fully developed condition, with its easily perceptible clinical signs, from the state which was demonstrable only by neuromuscular response elicited by very mild electrical or mechanical stimuli. The latter state he characterized as latent.

In studying the effects of ions on nerve-muscle preparations, Loeb (8, 9) showed that calcium decreased the irritability of these tissues, and that inadequacy of calcium increased their sensitivity. Studying these effects on nerves, Mathews (10) later substantiated Loeb's findings. After MacCallum and Voegtlin (11) had demonstrated that the tetany resulting from parathyroidectomy was attributable to lowered calcium concentration in the blood, Howland and Marriott (12) showed that infantile tetany and spasmophilia were characterized by a similar mechanism. Later Hess and his coworkers (13) induced tetany in rats merely by a swift change from a rickets-producing diet, high in calcium and low in phosphorus, to a diet of normal Ca:P ratio. The tetany was accompanied by a decline in serum calcium which was, however, maintained for only a few days. Recently Greenberg, *et al.* (14) have shown that reduction of the serum calcium, if produced slowly on a dietary basis, is insufficient to cause tetany in the rat.

Meanwhile, the critical levels of neuromuscular reactions in the galvanic test had been shown to vary with age. Furthermore, irregular and uninterpretable results at puberty sharply limited the application of the test. Confidence in its reliability was greatly shaken. With the development of the method for determining calcium concentration in the blood and the demonstration of hypocalcemia as

the primary disturbance in infantile tetany, the electrical techniques were largely superseded by the chemical method.

It soon became clear that calcium metabolism is affected by many factors operating through numerous and complex mechanisms. It was found that tetany resulted from alkalosis of various origins (hyperventilation, persistent vomiting, and ingestion of excessive alkalies) and that it might not be accompanied by any disturbance in the total calcium level of the blood (15, 16). Although some investigators maintained that alkalosis produced tetany directly, others asserted that it operated by disturbing the total calcium-ionized calcium equilibrium with lowering of the ionic calcium concentration. By the latter school, it was believed that tetany would appear with a normal concentration of total calcium in the blood when the ionic calcium concentration was lowered, and that diminished concentration of ionic calcium was an important cause of tetany. Studies on the concentration of diffusible calcium in tetany tended to confirm this hypothesis. But it remained a question whether diffusible calcium represented ionic calcium. Attempts to determine the concentration of ionic calcium were indirect until 1932, when McLean and Hastings (17, 18) introduced a biological method through which they showed that the concentration of ionic calcium is indeed diminished in tetany.

Unfortunately, there is no easy method for determining ionic-calcium concentration directly in routine surveys. The concentration of ionic calcium already had been shown to be influenced by the concentration of HCO_3^-, PO_4^{---}, and HPO_4^{--} ions when McLean and Hastings (18) found that it was to a much greater extent controlled by the concentration of protein in the serum (19). They have prepared a nomogram on which values for the concentrations of total calcium and total protein yield values for the concentration of ionic calcium (20).

Since calcium is likewise an important constituent of bone, disturbances in calcium economy are reflected in the osseous system.

Depending on circumstances, the result is rickets, osteomalacia, or osteoporosis. One form of rickets, the least common, is characterized by a high or normal concentration of phosphorus and a low concentration of calcium in the blood. Characteristic gross and histologic changes occur in the bone. Osteomalacia is regarded as adult rickets. In generalized osteoporosis, there is rarefaction or deficient calcification of the osseous tissue. Attempts have been made to determine calcium deficiency in the skeleton by a study of bone density from roentgenograms (21, 22).

When the Medical Evaluation of Nutrition Study was planned by the cooperating agencies, the lack of a simple yet sensitive test for calcium nutrition received considerable attention. It was decided to include irritability to galvanic current among the test procedures in order to evaluate it as a guide to the calcium nutrition of groups of subjects. Certain difficulties were recognized. Determinations of ionic calcium were not to be made, and the absence of any real relationship between *total* serum calcium and the galvanic response would not preclude the possibility that the galvanic reaction did depend upon the concentration of *ionic* calcium. Also, any relationship between total serum calcium and galvanic irritability might well hold only within a restricted region of calcium values, e.g., those indicative of marked deficiency. Above some critical value they might be entirely unrelated. Furthermore, evidence that neuromuscular irritability was independent of serum calcium would not necessarily disprove its value as an index to calcium nutrition, for the intricate mechanism serving to stabilize the calcium content of body fluids is such that decalcification of the skeleton may occur without change in the level of serum calcium (16).

It seemed clear that a rigorous experiment, devised to evaluate the galvanic test as a means of detecting mild calcium deficiency, would not be feasible in a survey of school children. Although the Study plan could not provide for such an experiment, it was felt that any truly useful bond between calcium nutrition and neuro-

muscular irritability should be evident in an extensive survey among adolescents diverging widely with respect to the adequacy of their calcium nutrition.

A problem of major importance arises from the lack of any valid information on the basis of which subjects might be arrayed according to their calcium nutrition. At best, the available data have only partial or presumptive value as indicators of calcium nutrition; none provides an accurate measure, and each may reflect a different aspect of calcium nutrition. The Study observations include a careful two-day diet history obtained in an interview with the subject, a calcium determination [following Clark and Collip's modification (23) of the Tisdall method] on the blood serum, and roentgenograms of hand and wrist, elbow, and hip. The diet data were processed by means of standard tables to yield a daily average calcium intake in grams. Information of this type is necessarily approximate and ignores the variation among foods with respect to the availability of the calcium to the organism. However, since foods of high calcium content, especially milk, tend to be consumed either habitually or little at all, the diet histories should suffice to classify the subjects into broad groups of differential calcium intake. The serum calcium of a given healthy individual does not usually fluctuate greatly over short periods of time, and the method which was followed may be relied upon to provide accurate determinations. However, the total serum calcium is of only doubtful value as an index to calcium nutrition.

The roentgenograms in the Study have been utilized to classify pupils for skeletal age and do not afford data on bone density which has been suggested as a useful criterion of calcium nutrition. The relation between calcium nutrition and skeletal development and maturation is not established, but it seems probable that a deficiency of calcium does affect skeletal growth. Therefore, the skeletal age, estimated according to Todd's method (21) and taken in relation to chronological age, is used as indirect, but by no means sure,

evidence on calcium nutrition. However, skeletal development depends upon so many environmental and physiological factors other than calcium nutrition that any connection between them may be obscured in a particular case. Certainly an adequate supply of calcium is but one factor in growth and development and does not itself control the growth process. Retarded skeletal development may not indicate deficient calcium nutrition, therefore, unless the meaning of the latter be extended to the entire metabolic process. On the other hand, the relationship should be strong enough to be perceptible in a statistical analysis of a large number of persons of different diet and mode of life.

Procedure and Apparatus

For the present Study an apparatus (Figure 1) was constructed to provide both "make" (closing) and "break" (opening) galvanic shocks of graduated intensity. The circuit was designed to avoid the usual difficulty of unpleasant or painful *closing* contractions before obtaining effective *opening* contractions. This is accomplished with the break-shock circuit by a presetting at a certain level of intensity which operates to cut off the rapidly rising current at the present level. The apparatus provides shocks up to 5 milliamperes in intensity, the readings being to the nearest ma. The discharge of a condenser is utilized to facilitate the location of motor points. Both anode and cathode may be employed as stimulating electrodes.

Since neuromuscular irritability is presumably fairly constant throughout the neuromuscular system of a particular subject at any one time, the choice of the nerve for stimulation is largely a matter of convenience. In the present Study the ulnar nerve was chosen. Three different levels of contraction were established:

(1) the first visible muscular twitch;
(2) a visible twitch of a finger; and
(3) a visible twitch of the entire hand.

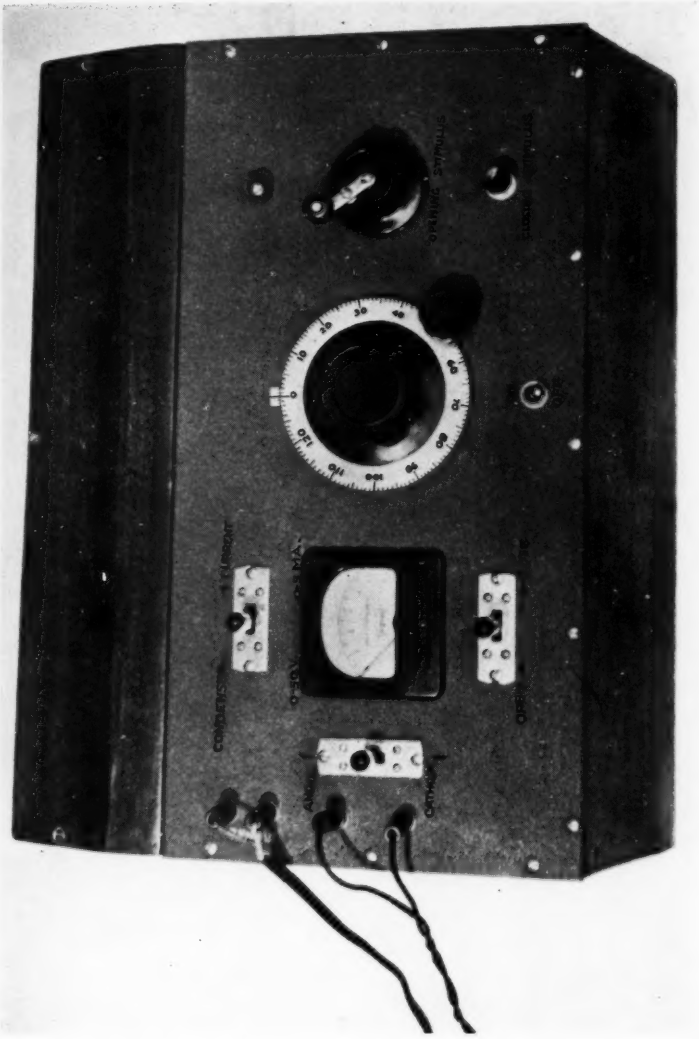


Fig 1. Panel of galvanic apparatus.

Fig. 2. Subject with electrodes adjusted.

Each subject was tested for both arms, and about twelve different readings were made on each arm.

The instrument was operated by two technicians, one handling the control panel and another taking care of the subject and observing his response to stimulation. The instructions for preparing the subject follow:

> The subject is seated on a high stool facing the instrument. The upper outer aspect of his right arm is briskly scrubbed with a cotton sponge soaked in alcohol. The same area is briskly rubbed with electrode jelly.
>
> A small amount of jelly is now rubbed over the arm, and the indifferent (plate) electrode is fastened snugly by means of the elastic strap. The same procedure of rubbing with alcohol and electrode jelly is followed for the area of the ulnar supracondylar notch of the elbow.
>
> The leather sling which hangs from an adjustable standard is now brought into position so that the forearm may be placed in it, and the height of the standard adjusted so that the forearm is horizontal and swings relaxed across the front of the body. (*See* Figure 2.)
>
> The stimulating (round-headed) electrode is now firmly applied to the bony notch felt in the ulnar region of the elbow and held by hand during the preliminary part of the test.

The motor point is then located by means of the condenser discharge, and the voltage required for the threshold response is recorded. With the cathode as the stimulating electrode, and the stimulus applied by closing the circuit, the least amount of current required to provoke each type of contraction is then determined. Similar values are then obtained by reversing polarity to make the anode the stimulating electrode. The shock is then applied by opening the circuit, first with the anode as the source of stimulation, and then the cathode. Having completed the tests on the right arm, the technicians prepare the left arm and proceed as before.

The observer was specially instructed in the technique of detecting the three levels of response. Although an effort was made to utilize a single pair of technicians as long as possible, personnel turnover on the Study was such that the final bulk of observations

reflects the work of many different pairs. This fact may explain some of the temporal variability in results discussed below.

The test was administered in many ways in the thought that its most suitable form could be readily selected if it proved useful in the detection of mild states of calcium deficiency. In addition to this multiplicity of form, the technique differs from previous work in two other respects. The more important of these is the use of three thresholds of response in place of the more common reliance upon the first perceptible muscular twitch. The other concerns the selection of the nerve to be stimulated. Most previous work has utilized either the peroneal or the median nerve.

Extraneous Sources of Variation in the Galvanic Response

The Subjects. The subjects examined during the course of the Study were pupils of the Fieldston Ethical Culture School and of the Seward Park High School, a private and a public high school drawing from very different income levels. Unless otherwise stated in connection with a particular point, this report is confined to subjects whose cultural background is Jewish. The galvanic tests were begun at Seward Park High School about April 1, 1939, and continued until the end of June. They were resumed about November 1 and completed during the middle of March, 1940. All the Fieldston pupils were tested between March 1 and April 15, 1940. Since the physical examination, blood tests, and other studies of any given pupil were all administered within a short period of time, the date of the galvanic test may be accepted as the date when any other information was obtained.

Age and Sex. In order to sharpen the comparison of the galvanic response with the various factors which may have a bearing upon calcium nutrition, the galvanic readings were explored for important sources of variation which might be controlled. Two which may be of general interest are age and sex. Significant age-trends have been recognized since Holmes' 1916 report (24) giving aver-

age values from birth to age 13. His age curves are drawn in Figure 3 together with the Study curves differentiated as to sex and variety of galvanic test. Holmes' curves explain why the age-trends in the Study data should be statistically insignificant. In parallel tests the agreement between his values and those reported here is reasonably close. The average level in Figure 3 for cathodal closing contraction (least perceptible twitch) lies between the averages of Stinzing (25) for *n. ulnaris I* and *n. ulnaris II* in adults of both sexes.

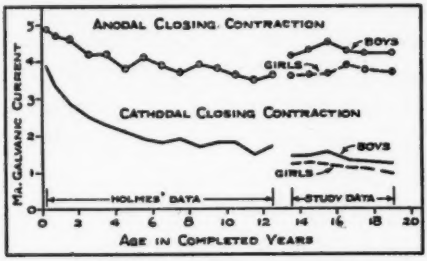


Fig. 3. Age variation in amount of galvanic current required to provoke anodal closing and cathodal closing contractions, comparison of Holmes' and Study data.

Consistent sex differentials stand out in Figures 3 and 4 and in all other varieties of the test as administered in the Study, although the literature on the electrical diagnosis of tetany makes no point of sex differences. The margin is small enough to be overlooked in anything but a fairly large series of observations. No explanation of the finding is ventured here. Table 1 compares boys and girls of each school with respect to the

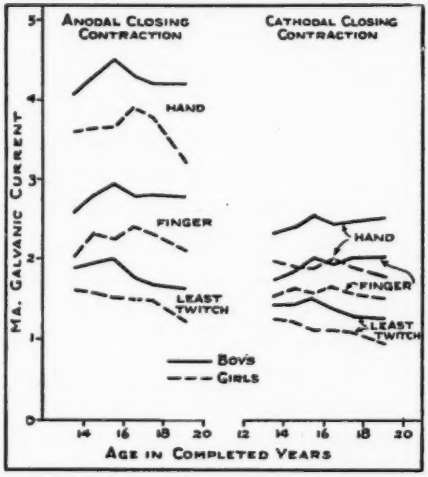


Fig. 4. Variation in amounts of galvanic current required to provoke anodal closing and cathodal closing contractions, by age, sex, and type of contraction.

Ma. Galvanic Current	Fieldston		Seward Park	
	Boys	Girls	Boys	Girls
Total	100.0	100.0	100.0	100.0
0–0.4	.5	—	—	—
0.5–0.9	—	—	.1	—
1.0–1.4	—	—	.1	.1
1.5–1.9	—	.6	—	.4
2.0–2.4	.6	3.6	.1	—
2.5–2.9	.5	—	.5	.7
3.0–3.4	—	5.4	.3	1.1
3.5–3.9	1.7	6.6	.8	1.3
4.0–4.4	4.5	4.8	.8	2.0
4.5–4.9	8.4	19.7	1.1	2.0
5.0 or More	83.8	59.3	96.2	92.4
Number of Cases	179	167	761	715

Table 1. Distribution of subjects by amount of galvanic current required to provoke a cathodal opening contraction, by sex and school.

stimulus required to produce a cathodal opening contraction (least perceptible twitch). The excess of low values among the girls is readily apparent and very significant in the statistical sense.

Varieties of Galvanic Test. Different ways of administering the galvanic test yield somewhat different results, each variety having its characteristic level. No attempt has been made to select from among those administered a "best" or most suitable test, since the analysis which follows reaches entirely negative conclusions. However, their very multiplicity makes some selection imperative.

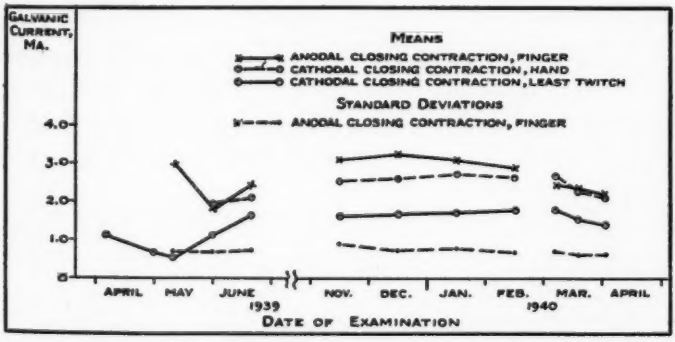
Parallel tests on right and left arms give the same results and may be regarded as interchangeable. The test based on the condenser discharge correlates poorly with other forms of the test. Since anodal opening contractions were seldom obtained with as little as 5 ma. of current, this test fails to differentiate subjects sufficiently for statistical purposes. This is somewhat less true of the cathodal opening contractions and this variety of the galvanic test was retained for further work. Among the others, good correlation was obtained for the anodal-cathodal comparison on the basis of the

least perceptible twitch, for the twitch-hand comparison using the cathode as the stimulating electrode, and for the hand-finger comparison on the basis of the cathode. Poor correlation was found for three twitch-finger comparisons, and for a twitch (anode)-hand (cathode) comparison. Probably good correlation would also obtain for the finger-hand comparison on the basis of the anode, but too many of the hand values were 5.0 or more. The forms finally chosen are:

Right arm, least twitch, cathodal opening stimulus
Right arm, least twitch, cathodal closing stimulus
Right arm, finger twitch, anodal closing stimulus
Right arm, hand twitch, cathodal closing stimulus

Time. The galvanic readings display a marked variation with time which cannot be satisfactorily explained on the basis of the Study observations. In order to increase the rigor of the test of the hypothesis which forms the subject of this paper, however, this significant but extraneous variation should be controlled by statistical means. For each of three galvanic tests, Figure 5 presents the mean values obtained for boys at different periods, and also the standard deviations for one of these. For the anodal closing contraction, Table 2 presents the mean and standard deviation for each

Fig. 5. Temporal variation in amount of current required to provoke contractions among boys.



time period by sex and by school. The values for the girls display similar heterogeneity. Statistical comparisons leave little room for belief that the results of the several periods differ only by chance. The principal source of heterogeneity is the jump from the spring, 1939, levels to the fall, 1939, levels. The middle period of fall and winter is one of fairly homogeneous values.

Table 2. Number of subjects and mean and standard deviation of amount of anodal closing current required to provoke finger contraction, by school, sex, and date of test.

Date of Test	Boys			Girls		
	Number of Cases	Mean (Ma.)	Standard Deviation (Ma.)	Number of Cases	Mean (Ma.)	Standard Deviation (Ma.)
	SEWARD PARK					
Total[1]	621	2.92	.868	602	2.32	.730
1939						
May 6–20	83	2.97	.691	86	2.48	.684
May 21–June 10	55	1.78	.642	56	1.51	.508
June 11–30	60	2.42	.716	83	2.04	.591
Nov. 1–30	65	3.12	.902	83	2.64	.862
Dec. 1–31	103	3.33	.749	94	2.51	.705
1940						
Jan. 1–31	194	3.09	.789	159	2.38	.619
Feb. 1–29	61	2.89	.700	41	2.32	.565
	FIELDSTON					
Total[1]	179	2.30	.665	167	2.10	.659
1940						
Feb. 29–Mar. 11	29	2.48	.713	78	2.30	.700
Mar. 12–25	54	2.34	.646	68	1.97	.597
Mar. 26–Apr. 8	96	2.21	.658	21	1.78	.460

[1] Standard deviations shown on total lines were obtained directly from Σx and Σx^2 for all cases, not from weighted means of the variances for different periods.

Variation of such magnitude could seriously interfere with the statistical investigation of the problem in hand, especially if the possible indicators of calcium nutrition also displayed temporal variation. That it might reflect the operation of truly seasonal factors is suggested by the decline in the late spring. It might also represent such changes in technical skill as make up the learning curve for the technique, or differential skill among technicians, e.g., in placing the electrodes and in observing the contractions. Errors in the placement of the electrode should produce high values. Similar reasoning applies to the observation of contractions, unless one assumes that the technician is as likely to report a nonexistent contraction as to fail to report one which actually occurs. When the technicians were learning, accordingly, high values would be expected. However, statistical analysis of the observational data does not support this interpretation. Moreover, the two pairs of technicians who made most of the early observations agree fairly well in their average values at the same periods. The available information is insufficient to determine whether the temporal variation has a physiological basis or whether it merely resulted from technical variation beyond control.[2]

The question of experimental error in the galvanic determinations has some bearing on the importance of technical variation during the learning process and also among different operators. Truly random errors, of course, would merely inflate the variances without disturbing the mean values. When parallel right and left readings were processed as independent duplicates, the resulting estimates of the error of measurement differed reliably among different technicians, but gave no further clue to the temporal varia-

[2] The pattern of seasonal variation shown by these data is consistent with one frequently observed for nutritional deficiencies, that is, poorer nutritional status in the late spring than in fall and winter. However, if the lower mean threshold for galvanic response in the spring derived from the nutritional status, one would expect a higher standard deviation for threshold values at this time, since presumably only some children would be affected. Contrary to this expectation, the standard deviation also decreased slightly, indicating a general shift to lower threshold values.

tion. On the assumption that the right and left values should correlate perfectly, and that the differences between them are randomly distributed about a mean of zero and are independent of the "true" values, the error variance for the cathode closing variety of the galvanic test is as large as the true variance. Hence, the variance of a set of measurements subject to this degree of error might be about twice what it should be. Although this estimate is necessarily approximate, error is certainly so large a part of any observed variability that no useful clinical purpose can be served by a single galvanic determination on a subject.

The large experimental error reduces the power of the observational data to reveal any correlation which might exist between neuromuscular irritability and calcium nutrition. If both the galvanic reaction and a particular indicator of calcium nutrition involved an experimental error sufficient to double each of the true variances, the highest possible estimate of any true correlation coefficient r would be $r' = r/2$. However, if a large number of observations revealed no significant correlation at all ($r' = o$), it would be reasonable to assume that r is o. Similarly, a significant coefficient of, say, $r' = .3$ might be regarded as a lower limit upon the probable value of r. Large as the experimental error undoubtedly is, therefore, it by no means disqualifies the observations for the task in hand.

If any set of galvanic observations made within a short time-interval is subject to some constant bias, and if the bias varies among periods, precision is lost by combining data obtained at different times. Although the problem of temporal variation in the Study data cannot be entirely resolved, it is readily circumvented if attention is confined to fairly short periods of time, when the galvanic observations tend to be fairly homogeneous. A constant error pervading all the readings of a period, it can be shown, would not affect the estimate of the correlation between the galvanic reading and another factor. In the main argument which follows, there-

fore, the relationship between the galvanic response and each of the possible indicators of calcium nutrition will be sought for fairly short time-intervals.

Galvanic Response and Calcium Intake

Wiehl (26) found that the diet histories of the Seward Park pupils frequently revealed deficient calcium intake. Seventy-two per cent reported an average daily calcium intake below the level recommended by the Committee on Food and Nutrition of the National Research Council, and 28 per cent reported an average intake of less than two-thirds of the recommended allowance. For a discussion of the collection and interpretation of the diet data the reader is referred to Wiehl's paper (26).

Complete distributions of pupils according to the estimated weight of their daily average calcium intake are shown in Table 3 for each school-sex group. The open character of the terminal groups and the evident skewness of the underlying distributions

Table 3. Distribution of subjects by reported daily average calcium intake, by school and sex.

Calcium Intake Gm. Daily	Fieldston		Seward Park	
	Boys	Girls	Boys	Girls
Total	100.0	100.0	100.0	100.0
Less Than .30	0	.6	1.4	4.0
.30– .39	.6	3.6	1.8	5.5
.40– .49	.5	6.0	3.3	6.9
.50– .59	.6	3.6	5.0	6.9
.60– .69	1.1	3.0	6.5	10.6
.70– .79	4.5	7.1	8.6	11.5
.80– .89	4.5	8.3	8.7	10.2
.90– .99	5.0	8.3	7.8	9.2
1.00–1.09	8.9	9.5	8.0	9.0
1.10–1.19	5.6	13.7	9.1	8.6
1.20–1.29	9.5	7.1	6.6	6.1
1.30 or More	59.2	29.2	33.2	11.5
Number of Cases	179	168	768	724

forbid reliance upon normal correlation theory. This is also true of the readings for the cathodal opening contraction (least perceptible twitch) as noted in conjunction with Table 1. The amounts of current required to provoke contractions under the cathodal closing stimulus (least perceptible twitch), the anodal closing stimulus for the finger, and the cathodal closing stimulus for the hand, on the contrary, are distributed in fairly normal fashion. The relationship between calcium intake and galvanic response, therefore, may be tested by the method of the contingency-table when the cathodal opening variety of the galvanic test is under consideration, and by analysis of variance when the other three galvanic tests are under scrutiny.

Each school-sex group was subdivided by date of test, and the resulting school-sex-time subgroups were analyzed individually. Table 4 gives the analysis for one such subgroup, the Seward Park girls tested in May and June, 1939. Although about a third of the 222 subjects reported an average daily calcium intake of less than .70 gm., there is no evidence that a disproportionate number of them required only small amounts of galvanic current to provoke the cathodal opening contraction. The numbers in parenthesis there

Table 4. Relation between calcium intake and galvanic response, cathodal opening contraction for Seward Park girls tested May and June, 1939.

Calcium Intake in Gm.	Ma. Galvanic Current		Total
	Under 5.0	5.0 or More	
Total	46	176	222
Under .70	16 (14.50)*	54 (55.50)	70
.70– .99	13 (13.06)	50 (49.94)	63
1.00–1.29	9 (10.98)	44 (42.02)	53
1.30 or More	8 (7.46)	28 (28.54)	36

$n=3$, $X^2=.695$, $.80 < P < .90$

* Values in parentheses are expected values calculated under assumption of independence.

are those "expected" on the assumption that the two factors are unrelated. Observed and expected values at least as divergent as these would occur by chance 80 to 90 per cent of the time under repeated sampling. Table 4 is typical of the tests which were made, as may be seen from the summary in Table 5. Statistical tests for intervals of even shorter length than those shown in the table were made, with similar results. It is quite clear, therefore, that if the reported calcium intake and the observed cathodal opening readings be accepted as valid, the two factors must be regarded as independent. Moreover, parallel analyses on the basis of the *anodal* opening stimulus gave essentially the same results.

Table 5. Summary of results of statistical tests of relationship between reported calcium intake and response to cathodal opening stimulus, by school and sex.

Sex	Date of Tests	Number of Classes		Computed Value of X^2	P[1]
		Ca.	Galvanic		
	FIELDSTON				
	1940				
Girls	Feb. 29–Apr. 8	4	3	8.39	.20
Boys	Feb. 29–Apr. 8	2	3	.11	>.95
	SEWARD PARK[2]				
	1939				
Girls	Mar. 21–May 10	2	2	*	.18
Girls	May 11–June 30	4	2	.70	.80–.90
Boys	Mar. 21–May 10	2	2	*	>.05
Boys	May 11–June 30	2	2	<.45	>.50

[1] P gives the probability with which differences equal to or exceeding those observed might arise through chance.

[2] No perceptible twitching was observed to occur under the cathodal opening stimulus applied to any Seward Park pupils tested from November, 1939 to March, 1940. As recorded, therefore, the data provide no evidence of association for this period also.

* On the basis of an exact test for four-fold tables.

In order to study calcium intake in relation to the other three galvanic tests, each school-sex-time subgroup was further divided into four parts differing with respect to calcium intake. The class intervals employed for calcium intake are those of Table 4. If the neuromuscular response actually does depend upon calcium intake, these four groups should differ significantly with respect to the amounts of current required to provoke a muscular contraction, and a low calcium intake should be accompanied by a low average galvanic value. Inspection of each set of means does not support this expectation, and analysis of the variance within and among intake classes reveals nothing beyond chance differences among them. The salient features of the analysis are set forth in Table 6 for the cathodal closing contraction (least perceptible twitch). Similar tables for the other two tests have been omitted for lack of space, but they permit the same conclusion.

On each horizontal line for a particular school-sex-time subgroup, Table 6 gives the set of means for the amount of current required to provoke the cathodal closing contraction, the degrees of freedom corresponding to the greater and to the lesser mean square, the variance ratio (usually the variance among classes divided by the variance within classes), and the probability judgment corresponding to the *F* ratio considered in relation to the degrees of freedom.

For the range of calcium intake characteristic of the Study subjects, the observations do not support the view that the galvanic response correlates with reported calcium intake.[8] It must be borne in mind that the subjects were on their usual, every-day diets and that the diet record was for only a two-day period. However frequently their average intake may have fallen below the recommended allowances for calcium, it may never have reached a level sufficiently low for a sufficiently long period for the reaction to

[8] The results of the galvanic test also were studied in relation to the calcium intake per kilogram of body weight. This analysis also gave no evidence of significant differences for the galvanic response among groups of children whose reported calcium intake per kg. was at different levels.

Table 6. Summary of results of statistical tests of relationship between reported calcium intake and cathodal current required to provoke perceptible contraction, by school, sex, and date of test.

Date of Test	Mean Ma. of Current by Calcium Intake, in Gm.				Degrees of Freedom		Variance Ratio (F)	P[1]
	Under .70	.70–.99	1.00–1.29	1.30 and Over	n_1	n_2		
1940	GIRLS, FIELDSTON							
Feb. 29–Mar. 11	1.39	1.56	1.32	1.50	3	74	1.34	>.05
Mar. 12–25	1.06	1.28	1.20	1.15	64	3	1.45	>.05
Mar. 26–Apr. 8	1.42		1.12		1	19	3.32	>.05
	BOYS, FIELDSTON							
Mar. 12–25	1.57		1.41	1.57	51	2	1.67	>.05
Mar. 26–Apr. 8	1.44		1.38	1.45	93	2	2.86	>.05
1939	GIRLS, SEWARD PARK							
Mar. 21–Apr. 20	.94	.89	.92	.74	71	3	2.75	>.05
Apr. 21–May 5	.57	.54	.41	.60	50	3	1.28	>.05
May 6–20	.41	.52	.52	.53	3	80	1.25	>.05
May 21–June 10	.88	.90	.93	.85	51	3	6.79	>.05
June 11–30	1.49	1.37	1.33	1.53	78	3	1.16	>.05
Nov. 1–30	1.44	1.39	1.30	1.20	3	60	1.54	>.05
Dec. 1–31	1.25	1.31	1.24	1.11	90	3	1.28	>.05
1940								
Jan. 1–31	1.41	1.38	1.22	1.27	3	152	2.10	>.05
Feb. 1–29	1.36	1.34	1.58		2	38	1.61	>.05
1939	BOYS, SEWARD PARK							
Mar. 21–Apr. 20	1.01	1.08	.92	1.21	3	89	1.54	>.05
Apr. 21–May 5	.67	.69	.63	.57	52	3	3.38	>.05
May 6–20	.52	.60	.53	.57	78	3	4.79	>.05
May 21–June 10	1.11	1.06		1.10	52	2	14.71	>.05
June 11–30	1.60	1.53	1.55	1.76	55	3	1.41	>.05
Nov. 1–30	1.89	1.34	1.71	1.52	3	44	1.87	>.05
Dec. 1–31	1.79	1.64	1.67	1.63	98	3	1.72	>.05
1940								
Jan. 1–31	1.86	1.73	1.81	1.68	3	185	1.05	>.05
Feb. 1–29	1.81	1.61	1.94	1.74	57	3	1.07	>.05

[1] Probability of obtaining a set of means equally or more divergent by chance.

galvanic stimuli to be affected. Subjects fed on experimental diets having a very low calcium content might manifest a disturbance of galvanic reaction not seen in the Study subjects. Even experimental verification of such a view would not alter the fact that no relationship is demonstrable within the extensive range of the reported calcium consumption of the Study subjects. Insofar as the reported absolute intake of calcium has any value as a sign of calcium nutrition, therefore, the galvanic test has no diagnostic value for subjects like those studied here.

Mention should be made of the experimental results obtained by Sjollema and Seekles (27) with rabbits. They varied the mineral content of experimental diets in order to provoke galvanic responses symptomatic of tetany in latent or clinically evident form. Although their observations are too few to permit precise conclusions, on diets having Ca./P ratios of between 1:2.25 and 1:4.5 their animals had normal galvanic reactions. Only when the ratio reached or exceeded 1:5.6 was it possible to diagnose tetany (latent or active) in their animals. In the normal human diet calcium and phosphorus tend to occur together in the same foods, and ratios of the order of 1:5.6 are rather unlikely. The same authors also report normal galvanic reactions for animals in a state of starvation.

Galvanic Response and Serum Calcium

Since the Study observations on serum calcium vary from one period to another, it is essential that any apparent relationship between serum calcium and galvanic response be independent of time. Hence, in this section also the analysis utilizes the individual school-sex-time groups as the basic units for which a relationship is to be sought. Since the serum calcium values are distributed in approximately normal fashion, normal correlation theory may be relied upon for the detection and measurement of any relationship with any but the cathodal opening variety of the galvanic test.

The distribution of values for the cathodal opening contraction

Serum Calcium Mg. Per Cent	Ma. Current Required for Cathodal Opening Contraction							
	2.0–2.4	2.5–2.9	3.0–3.4	3.5–3.9	4.0–4.4	4.5–4.9	5.0 or More	All
Total	1	1		2	5	8	65	82
10.0–10.4	1				3	2	17	23
10.5–10.9		1		1	1	6	35	44
11.0–11.4					1		13	14
11.5–11.9				1				1

As a 3 x 2 contingency table, $n=2$, $X^2=.90$, and $.50 < P < .70$.

Table 7. Relationship between serum calcium and galvanic response, Fieldston boys, cathodal opening contraction.

presents a special problem, but the method of the contingency table provides a convenient test of the association between serum calcium and the current required to provoke the cathodal opening contraction. The observations summarized in Table 7 are more or less typical of those available for study, except that the serum calcium values shown there are higher than those for Seward Park. The Fieldston boys examined in March and April, 1940, fail to support the position that neuromuscular irritability depends on serum calcium. All the statistical tests of this character are summarized in Table 8.

The serum calcium values for Seward Park pupils are somewhat lower, on the average, than those shown in Table 7 for Fieldston boys. The difference is thought to reflect either technical or seasonal variation. With but one exception, however, the probabilities of Table 8 suggest no reason to reject the position that the neuromuscular response to cathodal opening current is actually *independent* of serum calcium. The exception concerns Seward Park boys examined in April and May, 1939. The number having low (under 5.0 ma.) galvanic values among all those of stated serum calcium is: one among eight at the 9.5-9.9 mg. per cent level; two

among thirty-seven at the 10.0-10.4 mg. per cent level; four among fifty-four at the 10.5-10.9 mg. per cent level; and none among sixty-seven at or above 11.0 mg. per cent. Dividing the group at 11.0 mg. per cent makes a four-fold table with a slight suggestion of heterogeneity. Although the association is of the expected character, low galvanic values appearing with low serum calcium values, the probability of .07 fails to reach the .05 level arbitrarily used here, and no other portion of the statistical analysis reflects a similar pattern.

None of the other three galvanic tests furnishes values which are correlated with serum calcium, as may be seen from Table 9. The linear correlation coefficient (r) was computed for each school-sex-time group of sufficient size (the number of subjects ranges from 15 to 92). Taken individually, four of the fifty-six coefficients are

Table 8. Summary of analysis of relationship between serum calcium and cathodal opening contraction, by school, sex, and date of test.

Sex	Date of Test	Number of Classes		X^2	p[1]
		Ca.	Galvanic		
	FIELDSTON				
	1940				
Girls	Feb. 29–Apr. 8	2	3	1.31	.50–.70
Boys	Feb. 29–Apr. 8	3	2	.90	.50–.70
	SEWARD PARK[2]				
	1939				
Girls	Apr. 21–May 10	2	2	*	.25
Girls	May 11–June 30	3	2	.33	.80–.90
Boys	Apr. 21–May 10	2	2	*	.07
Boys	May 11–June 30	4	2	.75	>.80

[1] Chance of obtaining a set equally or more heterogeneous, under hypothesis of independence.

[2] All Seward Park pupils examined from November, 1939 to March, 1940 required at least 5 ma. for cathodal opening contraction.

* Exact test for four-fold table employed in lieu of chi-square approximation.

statistically significant at the P≦.05 level; but, if the underlying r's were truly *o*, one would expect to attach significance (erroneously) to three sample coefficients if the .05 criterion were employed, and the excess of one is unimpressive. All three distributions evidently center about *o*. For the cathodal closing contraction (least perceptible twitch) a statistical test of homogeneity shows that a set of coefficients equally or more divergent than that observed should occur once in ten trials even if one repeatedly sampled the same normal bivariate distribution having a given value of r, the population coefficient of correlation. The distribution of r' for the finger test (anodal closing) is more variable than would be expected from the operation of purely chance factors (.05>P>.02) but that for the hand test (cathodal closing) is homogeneous (.70>P>.50). However, the frequency distributions suffice to show that there is no reason to assume any real correlation between serum calcium and any of the three galvanic tests.

The absence of a significant relationship between serum calcium and galvanic response does not prove the galvanic test useless as a guide to calcium nutrition. It was noted above that serum calcium probably does not register the state of calcium nutrition enjoyed by

Table 9. Distributions of coefficients of correlation between serum calcium and galvanic response for three varieties of galvanic test.

Value of r'[1]	Cathodal Closing (Least Twitch)	Anodal Closing (Finger)	Cathodal Closing (Hand)
Total	22	18	16
−.44 to −.35	1	1	—
−.34 to −.25	1	2	2
−.24 to −.15	5	2	1
−.14 to −.05	5	3	3
−.04 to +.05	3	5	4
+.06 to +.15	6	2	5
+.16 to +.25	0	3	1
+.26 to +.35	1	—	—

[1] Each r' represents the experience of a particular school-sex-time group. The number in each such group varies from 15 to 92.

the organism unless very marked and clinically apparent symptoms are present. It is of interest, therefore, to note that calcium intake and serum calcium are entirely unrelated for the subjects in this Study. Sixteen school-sex-time groups were studied for variations in average serum calcium corresponding to differential calcium intake, but no positive relation between the two factors was disclosed.

Galvanic Response and Skeletal Age

For adolescents of the same chronological age, skeletal age is in some ways more closely associated with calcium nutrition than any other single measurement provided by the Study. Schmidt (28) has described how roentgenograms of hand and wrist, elbow, and hip were obtained for each subject and assessed against the Western Reserve University standards of Todd and his associates. The average of the three skeletal age equivalents was employed in the statistical analysis as the best estimate of general skeletal development.

Both Fieldston and Seward Park pupils are, on the average, above the Western Reserve standards for each chronological age. Although not without interest, this fact does not affect the argument here. Whether a particular group of subjects is above or below the average for a given age is a purely statistical question which can be reliably answered only on the basis of truly representative standards (averages). Either Todd's standards of skeletal age for each chronological age may not be truly representative, or even the relatively impoverished Seward Park pupils are above average in their skeletal development. Most of the Jewish children in the school partook of a relatively orthodox Jewish diet, and their consumption of dairy foods may have secured for them a better than average supply of calcium. However, the evidence of the diet histories (26) strongly suggests that their average calcium intake was frequently well below recommended allowances. Moreover, the precise chronological age equivalent of a given degree of skeletal

maturity is beside the point. What matters is that the x-rays make it possible to array any set of subjects of comparable chronological age according to the degree of skeletal maturity. If pupils of retarded skeletal maturity tend also to be deficient in their calcium nutrition, and if the galvanic response is a measure of calcium deficiency, then galvanic hyperirritability should be at least noticeably frequent among subjects whose skeletal development falls short of the average for their chronological age.

Although skeletal maturation is controlled only in part by the available supply of calcium, the relationship should be sufficiently close to invest skeletal age with some value as a guide to calcium nutrition, especially for the deficiency range. The retarded skeletal development of a particular subject may or may not represent inadequate calcium nutrition, but the relationship should in general be strong enough to provide a statistical basis for exploring the association between calcium nutrition and galvanic response. If this postulate be accepted, then any relationship between galvanic response and calcium nutrition would be indeed tenuous if it failed

Table 10. Relation between skeletal maturity and response to cathodal opening stimulus, for Fieldston girls of all ages.

MA. GALVANIC CURRENT	SKELETAL AGE[1]						
	Low		Moderate		Advanced		Total
TOTAL	41		97		28		166
Less Than 4.50	11	(8.65)*	20	(20.45)	4	(5.90)	35
4.50–4.99	8	(8.15)	16	(19.28)	9	(5.57)	33
5.00 or More	22	(24.20)	61	(57.27)	15	(16.53)	98

$n=4$, $X^2=4.52$, $.30 < P < .50$

[1] Taken in relation to chronological age. The distribution for each chronological age group was separated into three parts, and like parts for the different chronological age groups were summed.

* Values in parentheses are expected values calculated under assumption of independence.

to appear in so extensive an analysis of skeletal maturity and galvanic response as this Study furnishes.

The insignificant correlation between galvanic irritability and both calcium intake and serum calcium is reinforced by the apparent independence of skeletal age and galvanic response. Each school-sex-age group was sorted by skeletal age against each of the galvanic tests. The Study observations on the amount of current required to provoke the cathodal opening contraction are illustrated in Table 10 with the results obtained for the Fieldston girls.

Table 11. Summary of analysis of relation between skeletal age and galvanic response, by sex, school, and age.

Sex	Age	Number of Classes		X^2	p^1
		Skeletal Age	Current		
		FIELDSTON			
Boys	All[2]	3	2	<1.3	>.50
Girls	All[2]	3	3	4.5	.30–.50
		SEWARD PARK			
Boys	14	2	2	*	.16
	15	2	2	*	>.26
	16	2	2	<3.8	>.05
	17	2	2	*	>.12
	18	2	2	*	>.19
	All[2]	3	2	1.2	.50–.70
Girls	14	2	2	*	>.30
	15	2	2	<3.8	>.05
	16	2	2	2.1	.10–.20
	17	2	2	*	>.29
	18	2	2	*	.11
	All[2]	3	2	<1.6	>.30

[1] Chance of obtaining a set equally or more heterogeneous, under hypothesis of independence.
[2] Combined as described in footnote 1, Table 10.
* An exact test was made.

Three degrees of skeletal maturity were established at each age, and the data for the several ages were then combined to yield the 3 x 3 contingency table shown. The expected values (in parentheses) are close to those observed, and the chi-square value of 4.52 indicates a probability range of .30 to .50. In other words, there is no evidence whatever that retarded skeletal growth is associated with galvanic irritability as measured by the cathodal opening contraction. The information about single-year age groups is essentially similar to that shown for all the Fieldston boys and girls in Table 11. None of the tests on any of the Seward Park pupils also shown there suggests any reason for assuming the existence of a

Table 12. Summary of evidence on relation between skeletal age and galvanic response among Seward Park pupils, by sex, chronological age, and variety of galvanic test.

Age	Cathodal Closing Contraction (Twitch)			Anodal Closing Contraction (Finger)			Cathodal Closing Contraction (Hand)		
	Number of Pupils	Value of f'	P[1]	Number of Pupils	Value of f'	P[1]	Number of Pupils	Value of f'	P[1]
	BOYS								
13	22	+.249	>.10	20	+.251	>.10	19	+.238	>.10
14	90	−.002	>.10	82	+.151	>.10	76	+.065	>.10
15	180	+.151	.04	164	+.166	.03	148	+.244	<.01
16	213	−.059	>.10	186	+.059	>.10	159	−.004	>.10
17	151	+.014	>.10	114	−.135	>.10	85	−.019	>.10
18	40	+.182	>.10	30	+.094	>.10	27	+.007	>.10
	GIRLS								
14	91	+.037	>.10	86	+.020	>.10	76	−.071	>.10
16	202	+.045	>.10	175	+.034	>.10	153	+.001	>.10
18	29	+.047	>.10	28	+.043	>.10	20	+.055	>.10

[1] *P* gives the probability with which the degree of relationship observed might arise through chance.

real relationship between cathodal opening contraction and skeletal maturity.

The method of correlation analysis was followed for the other three galvanic tests, with the results summarized in Table 12 for various school-sex-age groups. There was considerable variation in skeletal age among subjects of a given chronological age, and of course the current required to provoke contractions varied greatly among subjects. Nevertheless, correlation analysis furnishes little reason to believe that galvanic irritability and retarded skeletal maturation have anything more than a chance association. The observations on the Fieldston pupils are omitted on the view that the experience of the Seward Park pupils provides a more cogent test of the value of the galvanic test, and only certain age groups among the Seward girls were studied. The correlation coefficients shown in Table 12 are both low and statistically insignificant in all but three instances. These were all obtained for the Seward Park boys aged 15 and are +.151, +.166, and +.244 for the cathodal closing (least twitch), anodal closing (finger), and cathodal closing (hand) tests, respectively. If the true coefficients were zero, the likelihood of obtaining such coefficients by chance would be rather small, as the tabled probability values indicate. However, the coefficients themselves are not large and, in view of their exceptional nature, they hardly constitute weighty evidence of a real relationship between galvanic response and skeletal maturity.

Conclusion

Three possible indicators of calcium nutrition were studied for their relationship to the neuromuscular response to galvanic stimulation in order to assess the value of the galvanic test as a possible means of detecting mild states of calcium deficiency in the body. Several varieties of the galvanic test were studied and the results of each were individually compared with determinations of total serum calcium, calcium intake, and relative skeletal maturity. Some

extraneous sources of variation were discovered and controlled by statistical means.

Although the Study utilized a sample of about 1,800 adolescents who varied widely in their calcium intake and in the difference between their chronological and skeletal ages, and appreciably in their total serum calcium, no significant relationship was found between galvanic hyperirritability and any of the three indicators of calcium nutrition. It must be borne in mind, however, that the Study furnished no assessment of calcium nutrition *per se,* and that it was possible to approach it only indirectly through such possibly related factors as calcium intake, serum calcium, and relative skeletal maturity.

That the galvanic test should have diagnostic value for tetany but not for such mild states of calcium deficiency as presumably inhered in the Study sample may mean that the deficiency characteristic of tetany is much more marked than the usual dietary deficiency, or qualitatively different from it. It is known that tetany is induced much more readily by factors which disturb the ionic calcium level in the blood than by simple dietary deficiency of calcium. Whatever the explanation, no evidence is provided that the neuromuscular response to galvanic stimulation provides a satisfactory basis for appraising the adequacy of the calcium nutrition of groups of adolescents.

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THE FREQUENCY OF DOCTORS' PRESCRIPTIONS AND OF LABORATORY AND RELATED SERVICES IN THE TREATMENT OF ILLNESS

BASED ON RECORDS FOR 9,000 FAMILIES IN EIGHTEEN STATES VISITED PERIODICALLY FOR TWELVE MONTHS, 1928-1931[1]

SELWYN D. COLLINS[2]

SOME years ago the small town physician was frequently the pharmacist also. Thus the writing and compounding of prescriptions were functions of the same individual, so there was little difference between direct dispensing by the physician and the writing of a prescription. Moreover, the purchase of medicine on the recommendation of the druggist was practically equivalent to procuring it on a doctor's prescription. Even medicine purchased over the counter was not entirely without the sanction of a physician since the doctor-proprietor of the small drug store handled most of the sales of medicines.

With the separation of the functions of the physician and pharmacist which exists today, the written prescription has become the common method of supplying the patient with the needed medicine. The present paper deals with the frequency in a surveyed group with which medicine was procured by doctor's prescription, by druggist's recommendation, and by purchase over the counter without either of these procedures. The frequency with which

[1] From General Morbidity Studies, Division of Public Health Methods, National Institute of Health.

This is the twenty-second of a series of papers on sickness and medical care in this group of families (1-21). The survey of these families was organized and conducted by the Committee on the Costs of Medical Care; the tabulation was done under a cooperative arrangement between the Committee and the Public Health Service. Committee publications based on the results deal primarily with costs and Public Health Service publications primarily with the incidence of illness and the extent and kind of medical care, without regard to cost. As costs are meaningless without some knowledge of the extent and nature of the service received, there is inevitably some overlapping. The Committee staff, particularly Dr. I. S. Falk and Miss Margaret Klem, cooperated in the tabulation of the data.

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laboratory and x-ray services and physiotherapy were used in the diagnosis or treatment of illness is also considered.

Source and Character of Data

In the study of illness in a group of families in eighteen States[3] that was made by the Committee on the Costs of Medical Care (22) and the United States Public Health Service, the record for each illness included a statement of medicine procured for the case by doctor's prescription or other methods, of laboratory and x-ray services received, and of physiotherapy used in treating the case.

The composition and characteristics of the group of 8,758 white families which were kept under observation for twelve consecutive months in the years 1928-1931 have been considered in some detail in the first report in the series (1). These families, including a total of 39,185 individuals, resided in 130 localities in eighteen States representing all geographic sections. Every size of community was included, from metropolitan districts to small industrial and agricultural towns and rural unincorporated areas[4]. With respect to income, the distribution was reasonably similar to the estimated distribution of the general population of the United States at the time of the survey.

Each family was visited at intervals of two to four months for a period long enough to obtain a sickness record for twelve consecutive months. On the first call a record was made of the number of members of the household, together with sex, age, marital status, occupation, and other facts about each person. On succeeding visits the canvasser recorded all illness that had occurred since the pre-

[3] The eighteen States sampled and the number of canvassed families were as follows: California (890), Colorado (386), Connecticut (100), District of Columbia (99), Georgia (544), Illinois (463), Indiana (494), Kansas (301), Massachusetts (287), Michigan (329), Minnesota (224), New York (1,710), Ohio (1,148), Tennessee (212), Virginia (412), Washington (551), West Virginia (318), Wisconsin (290). Further details about the distribution of the canvassed population are included in a preceding paper (1).

[4] Every community that was included in the study had either a local health department or some other organization employing a visiting nurse, or both; therefore, the most rural areas with no organized community services are not represented.

ceding call, with such pertinent facts about each case as the date of onset and duration; whether attended by a doctor; whether hospitalized; and the nature of such services as surgery, laboratory procedures, x-ray, and physiotherapy. Records for cases that were still sick at the preceding visit were brought up-to-date and when completed the termination was entered. Thus data are available about the frequency of these services in an observed population and the proportions of different types of cases that received them.

Definitions of Illness, Attendant, Medicine, and Special Services. An illness, for the purpose of this study, was defined as any symptom, disorder, or affection which persisted for one or more days or for which medical service[5] was received or medicine purchased. Illness included the results of both disease and injury. What was actually included as illness, however, was necessarily influenced not only by the informant's conception of sickness but also by her memory. With visits as infrequent as two to four months, it was inevitable that many of the unattended nondisabling illnesses would be terminated and forgotten before the next visit of the enumerator.

An illness was considered as attended if any type of practitioner was called in or consulted about the case, including all hospital cases and also those attended by nonmedical practitioners.

For each illness a record was made of medicine procured for this illness (a) on doctor's prescription (new or refill), (b) on druggist's recommendation, and (c) other medicine, that is, medicine procured without a doctor's prescription or druggist's recommendation. Doctors' prescriptions include medicine dispensed by the physician himself as well as that bought from a drug store on a written prescription; however, medicine recommended by a physician without a written prescription would presumably fall in the "other medicine" category, including bandages and other dress-

[5] Exclusive of dental services, eye refractions, immunizations, and health examinations rendered when no symptoms were present.

ings which were included with medicine[*]. Although the bulk of the "other medicine" may be assumed to be made up of patent preparations bought by the patient or his family, these other items must not be forgotten when considering this category.

It should be emphasized that what is here tabulated as medicine includes only that procured by purchase or otherwise for a specific illness. If the illness was one that recurred frequently such as coryza, bronchitis, or an attack of a chronic disease, the patient may have had on hand medicine formerly purchased by prescription; thus a case that used prescribed medicine might not be listed as having procured any medicine for this illness. Moreover, if such an illness was not attended, it was not recorded as a case that used medicine from the home supply, that category being limited to more or less common remedies that did not originate from prescriptions.

In other sections of the schedule entry was made of all laboratory and x-ray services received either in or outside of a hospital. Unfortunately it was impossible to distinguish in this study between x-ray used in the diagnosis of an illness and that used therapeutically, so all x-ray service was put in a single category. A record was also made of special services of the nature of physiotherapy. The report of the family informant may have been incomplete for these types of services. Certain kinds of laboratory procedures, such as urinalysis and blood tests, are routine for all admissions to some hospitals and with no separate charge the family may not have known that such service was rendered. Therefore, the percentage of cases with laboratory and other special services should be considered as a minimum statement of the use of such procedures in the diagnosis and treatment of illness. However, the data seem to be worth presenting because they are based on a fairly broad sample of the general population rather than upon the experience of any one physician, clinic, or hospital.

[*] Braces, crutches, artificial limbs, other appliances, and blood transfusions are not included with any category of medicine.

Classification of Causes of Illness. The diagnosis as reported by the family informant was submitted to the attending physician for confirmation or correction and his diagnosis substituted for the one given by the family. While reports could not be obtained from all attending physicians, the replies indicated that the housewife usually reported with reasonable accuracy the diagnosis which the physician had given to the family.[7]

Considering an illness in the sense of a continuous period of sickness, only 4.3 per cent of the illnesses were designated as due to more than one cause. In general, the more important or more serious cause was assigned as primary, except where a disease like pneumonia is commonly recognized as following measles or influenza, in which case the antecedent condition was taken as primary[8]. In this paper, tables for broad disease groups are based on sole or primary causes only; tables referring to more specific diagnoses are based primarily on sole causes but some data are shown for cases with two or more diagnoses, designated as complicated.

Extent of Illness from all Causes with Doctors' Prescriptions, Other Medicine, and Special Services

Medicines. In this group of families there were during the year 495 illnesses per 1,000 population for which medicine of some kind was procured by purchase or otherwise for the treatment of the specific case (Table 1). This is exclusive of the cases which were treated by home remedies or from a home stock or nonprescription medicine not purchased for this particular case. The 495 cases per 1,000 represent 58 per cent of the total illnesses (850 per 1,000) reported in the survey[9].

There were 368 illnesses per 1,000 persons for which medicine

[7] *See* comparison of diagnoses reported by families and by physicians in the Health Survey of 1935-1936 (23, Table 2).

[8] Further details on the method of classifying the causes of illness are included in the first report in the series (1).

[9] Rates here quoted have not been adjusted for age so are comparable only with "crude" rates in preceding papers in this series.

was procured on a doctor's prescription, including those with a new prescription and those in which an old prescription was refilled for this particular attack. In 27 cases per 1,000 persons medicine recommended by a druggist[10] (but none on doctor's prescription) was procured, and in the other 100 cases per 1,000 that represented the total with medicine, all drugs and dressings used were bought over the counter without a doctor's prescription or a druggist's recommendation.

Of the total cases reported in the survey, 43 per cent procured medicine on a doctor's prescription and of the cases attended by some practitioner 53 per cent procured medicine in this way[11]. Sixty-two per cent of the attended cases procured medicine of some kind for the specific case, as compared with 45 per cent of the unattended cases. The 45 per cent of the unattended cases is made up of 12 per cent in which medicine was procured on the recommendation of a druggist, 7 per cent in which a former prescription was refilled, and 26 per cent for which the only medicine was procured by some other method. In addition to the 45 per cent of the unattended cases for which medicine was procured for the particular case, 11 per cent were recorded as using home remedies or medicine from a home stock of nonprescription preparations.

Considering cases of all ages which procured medicine of any kind, the rate for males was 438 such illnesses per 1,000, as compared with rates for females of 549 for all causes and 501 for all except female genital and puerperal diagnoses. However, most of this difference between the sexes reflects variation in the rate of illness—among males 57 per cent of the cases procured some medicine for the case as compared with 59 per cent for females for all causes and also for the causes common to the two sexes.

[10] Only 207 cases or 5.4 per 1,000 persons procured medicine for the same attack on a doctor's prescription and also on a druggist's recommendation.

[11] Of cases attended by physicians not designated as specialists, 58 per cent procured medicine on a doctor's prescription, as compared with 45 per cent for specialists, and 48 per cent for cases attended by both a physician and a specialist.

Table 1. Frequency and proportion of illnesses[1] from all causes for which medicine was procured by doctor's prescription[2] and by other methods among persons of specific ages for each sex—8,758 canvassed white families in eighteen States during twelve consecutive months, 1928-1931.

Sex and Type of Rate	All Ages[3] (Crude)	Age									
		Under 5	5–9	10–14	15–19	20–24	25–34	35–44	45–54	55–64	65 and Over
	Cases[1] with medicine procured by the specified method per 1,000 population during year										
Any Medicine Procured by Any Method											
Both Sexes, All Causes	495	730	518	344	320	403	508	470	466	536	604
Male, All Causes	438	734	519	333	289	253	379	371	379	449	506
Female, All Causes	549	729	516	354	350	512	603	569	572	640	681
Female, All Except Genital and Puerperal	501	729	516	351	318	389	466	491	542	631	677
Medicine Procured on Doctor's Prescription[2]											
Both Sexes, All Causes	368	586	375	241	212	287	372	351	352	393	462
Male, All Causes	323	589	365	233	190	168	285	272	275	328	362
Female, All Causes	412	586	385	251	234	375	437	430	446	471	540
Female, All Except Genital and Puerperal	384	586	385	248	213	313	361	380	422	463	537
Medicine Procured on Druggist's Recommendation But None on Doctor's Prescription											
Both Sexes, All Causes	26.8	35.0	31.7	21.9	22.0	18.4	24.8	23.1	28.3	31.9	30.1
Male, All Causes	27.5	31.7	35.5	20.9	19.6	20.1	27.5	21.8	32.0	28.6	43.5
Female, All Causes	26.1	38.4	28.0	22.9	24.3	17.1	22.9	24.4	23.9	35.9	19.6
Female, All Except Genital and Puerperal	25.3	38.4	28.0	22.5	23.6	13.9	21.0	23.4	23.2	35.9	19.6
Medicine Procured Only by Methods Other Than Doctor's Prescription and Druggist's Recommendation											
Both Sexes, All Causes	99.8	108.8	111.3	80.3	85.9	96.7	111.0	96.1	85.3	110.7	112.2
Male, All Causes	88.3	113.2	119.5	80.0	79.9	64.9	67.0	77.9	72.1	92.0	100.7
Female, All Causes	111.0	105.1	103.3	80.7	91.9	120.0	143.6	114.5	101.6	133.0	121.2
Female, All Except Genital and Puerperal	92.2	104.7	103.3	80.7	81.4	62.0	84.0	87.1	96.9	131.5	121.2
	Percentage of ALL cases[1] that had medicine procured by the specified method										
Any Medicine Procured by Any Method											
Both Sexes, All Causes	58.2	66.2	53.0	50.6	53.3	59.9	61.9	60.7	61.3	63.4	61.7
Male, All Causes	56.8	59.3	52.0	48.7	51.5	55.7	62.1	60.2	60.7	62.1	59.4
Female, All Causes	59.4	61.4	54.0	52.6	54.9	61.5	61.8	61.1	61.8	64.6	63.1
Female, All Except Genital and Puerperal	59.2	61.5	54.0	52.6	54.1	62.3	62.2	60.9	61.7	64.5	63.3
Medicine Procured on Doctor's Prescription[2]											
Both Sexes, All Causes	43.3	48.4	38.3	35.6	35.3	42.7	45.4	45.3	46.3	46.5	47.2
Male, All Causes	41.8	47.6	36.5	34.0	33.8	36.9	46.7	44.0	44.0	45.4	42.5
Female, All Causes	44.5	49.3	40.2	37.2	36.7	45.0	44.8	46.2	48.2	47.5	50.1
Medicine Procured on Druggist's Recommendation But None on Doctor's Prescription											
Both Sexes, All Causes	3.2	2.9	3.2	3.2	3.7	2.7	3.0	3.0	3.7	3.8	3.1
Male, All Causes	3.6	2.6	3.5	3.0	3.5	4.4	4.5	3.5	5.1	4.0	5.1

Medicine Procured on Doctor's Prescription[3]											
Both Sexes, All Causes	43.3	48.4	38.3	35.6	35.3	42.7	45.4	45.3	46.3	46.5	47.2
Male, All Causes	41.8	47.6	36.5	34.0	33.8	36.9	46.7	44.0	44.0	45.4	42.5
Female, All Causes	44.5	49.3	40.2	37.2	36.7	48.0	44.8	46.2	48.2	47.5	50.1
But None on Doctor's Prescription											
Both Sexes, All Causes	3.2	2.9	3.2	3.2	3.7	2.7	3.0	3.0	3.7	3.8	3.1
Male, All Causes	3.6	2.6	3.5	3.0	3.5	4.4	4.5	3.5	5.1	4.0	5.1
Female, All Causes	2.8	3.2	2.9	3.4	3.8	2.1	2.3	2.6	2.6	3.6	1.8
Female, All Except Genital and Puerperal	3.0	3.2	2.9	3.4	4.0	2.2	2.8	2.9	2.6	3.7	1.8
Medicine Procured Only by Methods Other Than Doctor's Prescription and Druggist's Recommendation											
Both Sexes, All Causes	11.7	9.0	11.4	11.8	14.3	14.4	13.5	12.4	11.2	13.1	11.5
Male, All Causes	11.4	9.1	12.0	11.7	14.2	14.3	11.0	12.6	11.5	12.7	11.8
Female, All Causes	12.0	8.8	10.8	12.0	14.4	14.4	14.7	12.3	11.0	13.4	11.2
Female, All Except Genital and Puerperal	10.9	8.8	10.8	12.1	13.8	9.9	11.2	10.8	11.0	13.5	11.3
PERCENTAGE OF ATTENDED[4] CASES THAT HAD MEDICINE PROCURED BY THE SPECIFIED METHOD											
Any Medicine Procured by Any Method											
Both Sexes, All Causes	61.9	65.1	58.3	55.6	55.3	62.4	63.8	62.6	63.2	65.9	66.5
Male, All Causes	60.2	63.7	56.6	52.9	52.7	57.2	63.6	62.0	61.9	64.6	63.8
Female, All Causes	63.3	66.9	60.1	58.4	57.7	64.2	63.9	63.0	64.3	67.1	68.1
Female, All Except Genital and Puerperal	63.5	67.0	60.2	58.4	56.8	66.0	64.9	63.1	64.3	67.1	68.2
Medicine Procured on Doctor's Prescription[3]											
Both Sexes, All Causes	53.4	58.8	50.8	47.6	45.6	49.7	52.4	53.6	55.7	58.7	58.3
Male, All Causes	52.0	57.2	48.0	45.7	43.4	45.0	55.4	52.7	53.5	56.3	54.3
Female, All Causes	54.5	60.7	53.6	49.6	47.7	51.4	51.1	54.2	57.6	60.8	60.7
Female, All Except Genital and Puerperal	56.6	60.8	53.7	49.5	47.7	59.7	57.2	56.7	57.8	60.9	60.8
Medicine Procured on Druggist's Recommendation But None on Doctor's Prescription											
Both Sexes, All Causes	.66	.61	.67	.41	.44	.50	.67	.67	1.07	1.05	.79
Male, All Causes	.76	.47	.59	.36	.47	.94	1.00	1.01	1.51	1.10	1.42
Female, All Causes	.59	.77	.75	.46	.42	.34	.52	.44	.71	1.00	.42
Female, All Except Genital and Puerperal	.58	.77	.76	.47	.31	—	.51	.47	.66	1.02	.42
Medicine Procured Only by Methods Other Than Doctor's Prescription and Druggist's Recommendation											
Both Sexes, All Causes	7.8	5.7	6.9	7.6	9.2	12.2	10.7	8.3	6.4	6.2	7.4
Male, All Causes	7.4	6.0	8.0	6.8	8.8	11.3	7.2	8.4	6.9	7.3	8.2
Female, All Causes	8.2	5.4	5.7	8.3	9.6	12.5	12.3	8.3	6.0	5.2	6.9
Female, All Except Genital and Puerperal	6.4	5.4	5.7	8.4	8.7	6.3	7.2	6.0	5.8	5.1	7.0
PERCENTAGE OF UNATTENDED[4] CASES THAT HAD MEDICINE OF THE SPECIFIED KIND											
Any Medicine Procured by Any Method											
Both Sexes, All Causes	45.1	42.0	39.0	38.5	47.6	46.4	52.0	52.4	53.2	55.3	45.2
Male, All Causes	45.2	41.8	39.8	38.5	47.9	50.0	55.6	52.4	55.7	53.2	45.6
Female, All Causes	45.0	42.1	38.3	38.5	47.3	44.2	50.1	52.3	51.1	57.0	45.0
Female, All Except Genital and Puerperal	44.9	42.0	38.3	38.7	47.2	44.4	50.2	51.7	51.5	57.0	45.3
Medicine Procured by Refill of Doctor's Prescription											
Both Sexes, All Causes	7.4	9.4	6.1	6.5	6.1	5.4	8.0	7.8	7.3	6.9	8.7
Male, All Causes	6.9	9.6	5.9	5.6	4.7	7.0	6.5	7.6	5.7	6.3	5.6
Female, All Causes	7.9	9.2	6.2	7.3	7.2	4.3	8.9	8.0	8.6	7.3	10.9
Female, All Except Genital and Puerperal	8.0	9.2	6.2	7.4	7.1	4.5	9.2	8.2	8.7	7.3	10.9
Medicine Procured on Druggist's Recommendation But None on Doctor's Prescription											
Both Sexes, All Causes	12.0	11.4	9.9	10.0	12.8	14.7	15.5	13.5	14.8	12.7	11.0
Male, All Causes	13.1	10.8	11.4	9.5	12.7	17.4	20.7	14.2	19.7	14.3	16.7
Female, All Causes	11.1	11.9	8.4	10.5	12.9	13.0	12.7	13.0	10.5	11.5	7.0
Female, All Except Genital and Puerperal	11.0	11.9	8.4	10.3	13.4	12.8	12.7	12.9	10.6	11.5	7.0
Medicine Procured Only by Methods Other Than Doctor's Prescription and Druggist's Recommendation											
Both Sexes, All Causes	25.6	21.2	23.0	22.1	28.7	26.3	28.5	31.0	31.2	35.7	25.6
Male, All Causes	25.2	21.4	22.5	23.4	30.5	25.6	28.4	30.6	30.3	32.5	23.3
Female, All Causes	26.0	21.0	23.6	20.7	27.3	26.8	28.5	31.3	32.0	38.2	27.1
Female, All Except Genital and Puerperal	25.9	20.9	23.6	20.9	26.8	27.1	28.4	30.7	32.2	38.2	27.3
No Medicine Procured But Used Home Supply[5]											
Both Sexes, All Causes	11.1	9.3	12.0	13.2	11.9	11.2	8.2	10.4	11.1	12.7	14.2
Male, All Causes	10.6	8.4	11.4	12.8	13.1	11.6	8.0	11.9	9.2	10.3	12.2
Female, All Causes	11.4	10.2	12.6	13.6	11.0	10.9	8.2	9.2	12.8	14.5	15.5
Female, All Except Genital and Puerperal	11.5	10.2	12.6	13.7	11.4	11.3	8.1	9.4	12.9	14.5	15.6
NUMBER OF CASES[1] AND POPULATION OBSERVED											
Total Number of Attended[4] Cases											
Both Sexes, All Causes	25,569	5,265	4,032	2,191	1,352	1,201	3,891	3,759	2,054	953	758
Male, All Causes	11,284	2,774	2,045	1,113	645	320	1,205	1,486	925	455	282
Female, All Causes	14,277	2,483	1,987	1,078	707	881	2,686	2,273	1,129	498	476
Female, All Except Genital and Puerperal	12,786	2,478	1,983	1,069	643	633	1,971	1,912	1,060	489	472
Total Number of All Cases											
Both Sexes, All Causes	32,752	6,678	5,590	3,102	1,829	1,425	4,625	4,587	2,547	1,244	977
Male, All Causes	14,596	3,481	2,820	1,574	858	406	1,466	1,837	1,154	581	372
Female, All Causes	18,146	3,187	2,770	1,528	971	1,019	3,159	2,750	1,393	663	605
Female, All Except Genital and Puerperal	16,606	3,181	2,766	1,515	897	766	2,429	2,379	1,321	654	600
Population (Years of Life)											
Both Sexes	38,544	5,513	5,715	4,568	3,050	2,119	5,640	5,930	3,351	1,473	998
Male	18,896	2,808	2,820	2,301	1,527	894	2,402	2,979	1,845	804	437
Female	19,627	2,684	2,895	2,267	1,523	1,225	3,238	2,951	1,506	669	561

[1] Cases represent periods of illness regardless of the number of diagnoses; that is, these totals for all causes are the sums of data for cases with sole or primary diagnoses. Cases refer to those that lasted for one or more days (disabling and nondisabling) including those with prior onset that extended into the study year and those still sick at the last visit.
[3] Medicine procured on doctor's prescription includes new and refilled prescriptions and also medicine furnished by the doctor.
[3] All ages includes a few of unknown age; both sexes includes a few of unknown sex.
[4] Attended cases include those attended by medical and nonmedical practitioners, hospitals, and clinics but not cases attended only by a nurse or laboratory attendant.
[5] Home supply refers to medicines not originating from prescriptions and not procured for this case.

Medicine procured on a doctor's prescription showed similar sex differences; among males there were 323 cases with a prescription per 1,000 persons, as compared with rates for females of 412 for all causes and 384 for all except female genital and puerperal diagnoses. The proportion of all cases which had a doctor's prescription was 42 per cent for males and 45 per cent for females; of attended cases males had a doctor's prescription in 52 per cent as compared with proportions for females of 54 per cent for all causes and 57 per cent for all except female genital and puerperal diagnoses. Thus the excess in medicines procured by women represents largely an excess in the incidence of illness rather than in the procuring of medicine for the cases that occur.

Similarly, age differences in rates for cases with doctors' prescriptions and other medicine represent, to a considerable extent, age variation in the incidence of illness rather than in the percentage of illnesses for which medicine was procured by particular methods (Table 1). The percentage of cases with a doctor's prescription varies less with age than the cases per 1,000 persons with such medicine; the minimum occurs at 15-19 years, which is the age with the minimum illness rate. Aside from a lower percentage of cases having prescriptions from 5 to 25 years, age differences are small.

Special Services. There were during the survey year 51.3 cases with laboratory service of some kind per 1,000 population. Among males the rate was 35.2 per 1,000 as compared with rates for females of 66.7 for all causes and 46.3 for all except female genital and puerperal diagnoses (Table 2). There is not so much variation with age except for an unusually high rate of laboratory service for females of the ages 20-44 which is apparently due to puerperal diagnoses.

Of all attended cases, 7.7 per cent had some laboratory service[13]; among males the percentage was 5.9 as compared with percentages

[13] Of cases attended by physicians not designated as specialists, 5.1 per cent had some laboratory service, as compared with 15.3 per cent for specialists and 35.7 per cent for cases attended by both a physician and a specialist.

8,758 canvassed white families in eighteen States during twelve consecutive months, 1928-1931.

Sex and Type of Service	All Attended Cases				Hospital Cases				Nonhospital Attended Cases			
	All Ages[1]	Under 20	20–44	45 and Over	All Ages[1]	Under 20	20–44	45 and Over	All Ages[1]	Under 20	20–44	45 and Over
	CASES WITH THE SPECIFIED SERVICE PER 1,000 POPULATION DURING YEAR											
Laboratory Service[3]												
Both Sexes, All Causes	51.3	37.4	68.7	54.1	35.2	25.2	50.2	31.6	16.1	12.2	18.5	22.5
Male, All Causes	35.2	34.4	33.3	41.2	24.2	24.3	23.1	25.3	11.1	10.0	10.2	15.9
Female, All Causes	66.7	40.6	98.6	68.7	45.8	26.2	73.1	38.7	21.0	14.4	25.5	30.0
Female, All Except Genital and Puerperal	46.3	39.4	47.3	65.4	28.5	25.2	29.9	35.8	17.8	14.2	17.4	29.6
X-ray Service[3]												
Both Sexes, All Causes	26.1	20.0	30.8	34.0	9.2	5.7	11.1	15.8	16.9	14.3	19.7	18.2
Male, All Causes	27.0	23.7	29.0	33.1	8.8	6.8	9.4	13.3	18.2	16.9	19.6	19.8
Female, All Causes	25.3	16.3	32.4	35.1	9.6	4.6	12.5	18.6	15.7	11.7	19.8	16.5
Female, All Except Genital and Puerperal	24.0	16.2	29.4	34.4	8.9	4.6	10.7	18.3	15.2	11.6	18.7	16.1
Physiotherapy[4]												
Both Sexes, All Causes	11.5	7.5	12.4	22.3	1.6	1.0	2.0	2.6	9.9	6.5	10.4	19.8
Male, All Causes	10.3	6.9	10.8	19.8	1.4	1.1	1.9	1.6	8.8	5.8	8.9	18.1
Female, All Causes	12.7	8.1	13.8	25.2	1.8	1.0	2.0	3.7	11.0	7.2	11.7	21.6
Female, All Except Genital and Puerperal	11.9	8.1	11.7	24.5	1.5	1.0	1.3	3.3	10.4	7.2	10.4	21.2
	PERCENTAGE OF ATTENDED CASES WITH THE SPECIFIED SERVICE											
Laboratory Service[3]												
Both Sexes, All Causes	7.7	5.5	10.6	8.4	57.5	48.2	64.1	64.3	2.7	1.9	3.3	3.8
Male, All Causes	5.9	4.9	6.9	7.6	50.9	46.3	55.1	59.5	2.0	1.6	2.3	3.2
Female, All Causes	9.2	6.1	12.5	8.9	61.7	50.6	67.0	68.4	3.2	2.3	3.8	4.2
Female, All Except Genital and Puerperal	7.1	6.0	7.8	8.9	58.0	49.9	64.0	71.0	3.0	2.3	3.1	4.3
X-ray Service[3]												
Both Sexes, All Causes	3.9	2.9	4.8	5.3	15.1	10.9	14.2	32.2	2.8	2.3	3.5	3.0
Male, All Causes	4.5	3.4	6.0	6.1	18.5	12.9	22.4	31.3	3.3	2.6	4.5	4.0
Female, All Causes	3.5	2.4	4.1	4.6	13.0	8.9	11.5	32.9	2.4	1.9	2.9	2.3
Female, All Except Genital and Puerperal	3.7	2.5	4.8	4.7	18.0	9.1	22.8	36.2	2.5	1.9	3.3	2.3
Physiotherapy[4]												
Both Sexes, All Causes	1.7	1.1	1.9	3.5	2.6	1.9	2.5	5.2	1.6	1.0	1.8	3.3
Male, All Causes	1.7	1.0	2.3	3.7	3.0	2.0	4.6	3.8	1.6	.9	2.0	3.7
Female, All Causes	1.8	1.2	1.7	3.3	2.4	1.9	1.9	6.5	1.7	1.2	1.7	3.0
Female, All Except Genital and Puerperal	1.8	1.2	1.9	3.3	3.0	1.9	2.9	6.5	1.7	1.2	1.8	3.1
	PERCENTAGE OF SURGICAL CASES WITH THE SPECIFIED SERVICE											
Laboratory Service[3]												
Both Sexes, All Causes	35.5	29.7	42.2	42.2	58.8	52.4	64.4	68.1	1.3	1.0	2.3	—
Male, All Causes	28.6	25.4	32.4	36.6	54.2	49.9	58.8	63.4	.9	1.1	.7	—
Female, All Causes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Male, All Causes	15.2	13.1	15.1	26.8	13.5	10.6	18.1	33.8	14.8	15.7	11.6	17.3
Female, All Causes	13.3	9.0	14.0	27.1	13.9	7.4	15.4	33.7	12.0	11.8	10.8	14.6
Female, All Except Genital and Puerperal	14.0	9.1	16.6	28.6	15.0	7.4	19.0	37.5	12.3	11.9	12.0	13.0

Laboratory Service[4]												
Both Sexes, All Causes	35.5	29.7	42.2	42.2	58.8	52.4	64.4	68.1	1.3	1.0	2.3	—
Male, All Causes	28.6	25.4	32.4	36.6	54.2	49.9	58.8	63.4	.9	1.1	.7	—
Female, All Causes	42.1	33.5	47.2	47.1	63.2	54.9	67.11	71.7	1.9	.8	3.8	—
Male, All Causes	15.2	13.1	15.1	26.8	15.5	10.6	18.1	33.8	14.8	15.7	11.6	17.3
Female, All Causes	13.3	9.0	14.0	27.1	13.9	7.4	15.4	33.7	12.0	11.8	10.8	14.6
Female, All Except Genital and Puerperal	14.0	9.1	16.6	28.6	15.0	7.4	19.0	37.5	12.3	11.9	12.0	13.0
Physiotherapy[4]												
Both Sexes, All Causes	1.8	1.1	2.7	3.0	2.1	1.1	2.9	3.7	1.5	1.0	2.3	2.0
Male, All Causes	1.5	.8	3.1	1.6	2.4	1.4	4.5	2.8	.5	.3	1.4	—
Female, All Causes	2.2	1.4	2.5	4.3	1.8	.8	2.2	4.3	2.9	2.4	3.2	4.2
Female, All Except Genital and Puerperal	1.9	1.4	1.7	4.8	1.6	.8	1.7	5.0	2.4	2.4	1.6	4.3
	PERCENTAGE OF ATTENDED NONSURGICAL CASES WITH THE SPECIFIED SERVICE											
Laboratory Service[3]												
Both Sexes, All Causes	4.8	2.7	7.3	5.8	55.4	36.0	63.8	59.3	2.7	2.0	3.3	3.9
Male, All Causes	3.2	2.3	3.9	5.3	43.7	35.9	47.7	55.0	2.1	1.6	2.4	3.3
Female, All Causes	6.0	3.1	9.0	6.2	60.9	37.3	67.0	63.5	3.3	2.4	3.8	4.3
Female, All Except Genital and Puerperal	4.1	3.0	4.5	6.3	48.7	33.0	54.5	67.2	3.0	2.4	3.1	4.4
X-ray Service[3]												
Both Sexes, All Causes	2.9	2.0	3.7	3.6	15.8	16.4	12.0	30.1	2.3	1.7	3.2	2.7
Male, All Causes	3.3	2.2	5.0	4.5	25.1	19.5	31.4	28.3	2.6	1.8	4.1	3.5
Female, All Causes	2.5	1.8	3.1	3.0	11.7	13.6	8.2	31.7	2.1	1.5	2.7	2.0
Female, All Except Genital and Puerperal	2.7	1.8	3.8	3.1	25.4	14.7	30.9	34.5	2.2	1.5	3.1	2.1
Physiotherapy[4]												
Both Sexes, All Causes	1.7	1.1	1.8	3.5	3.5	4.4	2.1	7.3	1.7	1.0	1.8	3.3
Male, All Causes	1.7	1.0	2.2	3.8	4.3	3.9	4.7	5.0	1.7	.9	2.1	3.8
Female, All Causes	1.7	1.2	1.7	3.2	3.2	5.1	1.6	9.5	1.6	1.1	1.7	3.0
Female, All Except Genital and Puerperal	1.8	1.2	1.9	3.2	6.5	5.5	5.5	8.6	1.7	1.1	1.9	3.1
	TOTAL NUMBER OF CASES[5]											
Number of Surgical Cases												
Both Sexes, All Causes	2,439	1,317	851	263	1,452	735	547	163	987	582	304	100
Male, All Causes	1,187	739	324	123	618	369	177	71	569	370	147	52
Female, All Causes	1,252	578	527	140	834	366	370	92	418	212	157	48
Female, All Except Genital and Puerperal	1,068	574	362	126	686	364	237	80	382	210	125	46
Number of Attended Nonsurgical Cases												
Both Sexes, All Causes	23,130	11,523	8,000	3,502	905	250	525	123	22,225	11,273	7,475	3,379
Male, All Causes	10,097	5,838	2,687	1,539	279	128	86	60	9,818	5,710	2,601	1,479
Female, All Causes	13,025	5,677	5,313	1,963	622	118	439	63	12,403	5,559	4,874	1,900
Female, All Except Genital and Puerperal	11,718	5,599	4,154	1,895	279	109	110	58	11,439	5,490	4,044	1,837

[1] All ages includes a few of unknown age; both sexes includes a few of unknown sex.
[3] One or more kinds of laboratory service (exclusive of x-ray)—*see* Table 6 for specific services included.
[3] X-ray used in the diagnosis or treatment of the case.
[4] One or more kinds of physiotherapy—*see* Table 7 for specific services included.
[5] *See* Table 1 for population observed.

for females of 9.2 for all causes and 7.1 for all except female genital and puerperal diagnoses.

Of all hospital cases, 57 per cent had some laboratory service as compared with 3 per cent for attended cases not in a hospital. Surgical and nonsurgical hospital cases had about the same percentages with such service, 59 and 55 per cent respectively; of the minor surgical cases that were not hospitalized, 1.3 per cent had laboratory service as compared with 2.7 for nonsurgical attended cases that were not hospitalized. Thus hospitalization is more important than surgery in considering the frequency of laboratory service.

A record was made of the kind of laboratory which rendered the service. Of the 1,976 cases with one or more laboratory procedures, there were 1,935 for which the type of laboratory which did the work was reported. In 67.8 per cent of these 1,935 cases, part or all of the service was done in a hospital laboratory, in 20.4 per cent part or all of the work was done in the laboratory of a physician who was not designated as a specialist, in 4.9 per cent in a specialist's laboratory, in 4.2 per cent in a commercial laboratory, in 3.5 per cent in a public laboratory, in 2.3 per cent in the laboratory of a public clinic, and in 2.2 per cent in the laboratory of a private medical group. Cases for which work was done in two or more kinds of laboratory are counted in all types specified.

There were during the survey year 26.1 cases per 1,000 population which reported the use of x-ray service for diagnostic or therapeutic purposes. There was little variation in this rate as between the sexes but there was some increase with age.

Of all attended cases, 3.9 per cent had some x-ray service[19]. Among hospital cases 15.1 per cent had x-ray service, as compared with 2.8 per cent for nonhospital attended cases. Surgical and nonsurgical hospital cases reported about the same proportions with x-ray, 14.6 and 15.8 per cent, respectively. Nonhospital surgical cases had about

[19] Of cases attended by physicians not designated as specialists, 2.6 per cent had x-ray service, as compared with 5.9 per cent for specialists and 18.6 per cent for cases attended by both a physician and a specialist.

as much x-ray as hospital cases, 13.6 per cent; but among nonhospital nonsurgical cases, only 2.3 per cent of the attended cases had any x-ray services[14]. In this connection it must be remembered that x-ray is frequently used on accident cases and that in this study the setting of a bone or placing of a cast was considered a surgical procedure.

During the survey year there were 11.5 cases per 1,000 population which reported some form of physiotherapy on the case. The rate for males was 10.3 per 1,000 as compared with rates for females of 12.7 for all causes and 11.9 for all except female genital and puerperal diagnoses. Both sexes showed considerable increase with age in physiotherapy rates.

Only 1.7 per cent of the attended cases had any physiotherapy[15]; there was little variation as between the sexes but the percentage of cases with physiotherapy increased with age. Hospital cases had only slightly higher proportions with physiotherapy, 2.6 per cent as compared with 1.6 per cent for nonhospital cases. Likewise there were no large variations in the percentage receiving physiotherapy among surgical as compared with nonsurgical attended cases.

Proportion of Cases of Each Disease with Doctors' Prescriptions, Other Medicine, and Special Services

Medicines. The proportion of cases which had medicine procured by prescription and by other means varies greatly for different diagnoses. Table 3 shows these facts for illnesses classified into thirteen broad diagnosis groups and Tables 4 and 5 show similar data for a large number of specific diseases.

[14] A reflection of the same tendency is found in the fact that only about one-third of the cases with x-ray reported that the service was received in a hospital, whereas about two-thirds of the cases with laboratory service received it in a hospital. On the other hand nearly half of the cases receiving x-ray service obtained it in the offices of private physicians and specialists, as compared with only one-fourth of the cases receiving laboratory service.

Physiotherapy tends to be done in the offices of private practitioners rather than in hospitals. More than three-fourths of the cases with physiotherapy received the service in offices of private doctors and specialists.

[15] Of cases attended by an osteopath, 4.6 per cent had some form of physiotherapy, as compared with 1.1 per cent for chiropractors, 1.2 per cent for physicians not designated as specialists, 1.9 per cent for specialists, and 4.5 per cent for cases attended by both a physician and a specialist.

Table 3. Medicine, laboratory, physiotherapy, and x-ray services rendered within the year of observation in connection with illnesses from broad groups of causes—8,758 canvassed white families in eighteen States during twelve consecutive months, 1928-1931.

Disease and Whether Sole Diagnosis or Complicated by Another Disease[2]	Number of Attended Cases	Percentage of Attended Cases[1] Which Had:					Number of Unattended Cases	Percentage of Unattended Cases[1] Which Had:				Total Number of Cases	Percentage of All Cases[1] Which Had Medicine Procured for This Case:		
		Medicine Procured for This Case		One or More Kinds of Laboratory Services	X-ray Used for Diagnosis or Treatment of Case[4]	One or More Forms of Physiotherapy		Medicine Used from Home Supply But None Procured for This Case	Medicine Procured for This Case						
		On Doctor's Prescription (New or Refilled)[3]	But None on Doctor's Prescription						But None on Druggist's Recommendation or Doctor's Prescription	On Druggist's Recommendation But None on Doctor's Prescription	By Refilling of Doctor's Prescription[3]		On Doctor's Prescription (New or Refilled)[3]	On Druggist's Recommendation But None on Doctor's Prescription	But None on Druggist's Recommendation or Doctor's Prescription
All Causes															
Sole or Primary	25,569	53.4	8.5	7.7	3.9	1.7	7,183	11.1	25.6	12.0	7.4	32,752	43.3	3.2	11.7
Sole	24,290	52.9	8.4	7.3	3.7	1.7	7,054	11.0	25.8	12.0	7.4	31,344	42.7	3.2	11.8
Complicated	2,673	62.7	9.8	17.5	8.3	2.5	269	13.3	19.6	13.0	7.0	2,942	57.6	1.9	9.9
Minor Respiratory Diseases															
Sole or Primary	7,283	68.7	4.7	1.5	.5	.8	4,053	13.0	27.9	13.0	7.2	11,336	46.7	4.9	12.7
Sole	6,869	68.8	4.7	1.3	.4	.7	3,966	12.9	28.2	13.0	7.2	10,835	46.2	5.0	13.0
Complicated	516	68.4	6.6	4.1	3.5	1.6	102	16.7	13.7	14.7	4.9	618	57.9	3.6	6.6
Other Respiratory Diseases															
Sole or Primary	1,991	45.2	8.2	22.8	5.9	1.5	100	5.0	33.0	21.0	18.0	2,091	43.9	1.4	9.0
Sole	1,881	44.6	8.0	21.8	5.1	1.3	100	5.0	33.0	21.0	18.0	1,981	43.2	1.5	8.8
Complicated	270	62.2	9.3	27.8	18.1	4.4	[5]	—	—	—	—	274	61.7	.7	8.8
Minor Digestive Diseases															
Sole or Primary	1,772	66.6	4.4	1.9	1.9	.4	551	11.8	23.2	12.5	6.7	2,323	52.4	3.4	8.4
Sole	1,710	66.4	4.3	1.9	1.9	.4	543	11.8	22.8	12.7	6.6	2,253	52.0	3.5	8.4
Complicated	146	67.8	7.5	3.4	4.8	—	38	10.5	28.9	13.2	5.3	184	54.9	3.8	10.9
Other Digestive Diseases															
Sole or Primary	945	50.4	15.8	27.1	10.1	1.2	86	5.8	24.4	18.6	15.1	1,031	47.4	2.3	15.7
Sole	859	50.1	15.5	25.1	9.0	1.0	85	5.9	24.7	18.8	15.3	944	46.9	2.4	15.6
Complicated	155	50.3	16.8	43.9	18.7	2.6	[5]	—	—	—	—	160	49.4	1.9	16.3
Communicable Diseases															
Sole or Primary	2,496	50.6	8.7	4.9	.8	1.0	1,175	8.4	12.2	4.9	5.6	3,671	36.2	2.1	9.2
Sole															
Sole or Primary	676	51.0	5.6	4.4	2.4	.9	47	14.9	14.9	12.8	10.6	723	48.4	1.1	5.9
Sole	648	50.8	5.7	3.9	1.5	.9	47	14.9	14.9	12.8	10.6	695	48.1	1.2	6.0
Complicated	197	71.1	5.6	11.2	8.6	2.0	15	26.7	6.7	13.3	13.3	212	67.0	.9	5.7

Communicable Diseases														
Sole or Primary	2,496	50.6	8.7	4.9	.8	1.0	1,275	8.4	12.2	4.9	5.6	3,671	30.2	8.1	9.8
Sole	676	51.0	5.6	4.4	2.4	.9	47	14.9	14.5	12.8	10.6	723	48.4	1.1	5.9
Complicated	648	50.8	5.7	3.9	1.5	.9	47	14.9	14.9	12.8	10.6	695	48.1	1.2	6.0
	197	71.1	5.6	11.2	8.6	2.0	15	26.7	6.7	13.3	13.3	212	67.0	.9	5.7
Nervous Diseases Except Cerebral Hemorrhage, Paralysis, Neuralgia and Neuritis														
Sole or Primary	465	61.5	4.3	7.7	4.7	3.0	34	8.8	32.4	8.8	20.6	499	58.7	1.0	5.8
Sole	445	61.3	4.3	7.4	4.0	3.1	33	9.1	33.3	9.1	21.2	478	58.6	1.0	5.9
Complicated	71	64.8	2.8	16.9	9.9	1.4	[5]	—	—	—	—	78	60.3	2.6	5.1
Rheumatism and Related Diseases														
Sole or Primary	699	56.7	6.7	4.3	4.7	9.2	98	11.2	39.8	14.3	8.2	797	50.7	2.5	10.0
Sole	673	56.6	6.8	3.7	4.6	9.1	96	10.4	39.6	14.6	7.3	764	50.5	2.6	10.1
Complicated	93	68.8	7.5	20.4	11.8	9.7	[5]	—	—	—	—	106	62.3	1.9	8.5
Degenerative Diseases														
Sole or Primary	1,161	61.7	7.1	17.5	8.4	2.6	57	1.8	19.3	12.3	22.8	1,218	59.9	1.3	6.9
Sole	973	60.2	6.9	17.6	8.2	2.6	47	2.1	19.1	10.6	23.4	1,020	58.5	1.0	7.0
Complicated	389	70.7	7.5	18.0	8.0	2.1	21	—	33.3	9.5	14.3	410	67.8	2.0	7.3
Skin Diseases														
Sole or Primary	1,146	58.5	8.5	2.0	2.1	3.8	195	6.2	32.8	20.5	13.3	1,341	51.9	4.0	11.0
Sole	1,134	58.4	8.4	1.9	2.1	3.9	195	6.2	32.8	20.5	13.3	1,329	51.8	4.0	11.0
Complicated	64	56.3	17.2	14.1	3.1	—	[5]	—	—	—	—	66	56.1	1.5	15.2
Female Genital and Puerperal Diagnoses														
Sole or Primary	1,491	36.8	24.3	26.9	1.7	1.1	49	4.1	34.7	10.2	4.1	1,540	35.7	1.0	24.0
Sole	1,397	36.1	24.7	26.1	1.5	1.1	48	4.2	35.4	10.4	4.2	1,445	35.0	1.0	24.4
Complicated	192	47.9	18.2	39.6	7.8	1.6	[5]	—	—	—	—	197	46.7	.5	18.3
Accidental Injuries														
Sole or Primary	2,595	26.4	14.3	2.8	14.3	2.2	285	9.8	37.8	17.5	3.8	2,880	24.1	2.4	15.9
Sole	2,553	26.3	14.0	2.5	14.3	2.0	284	9.8	37.9	17.2	3.9	2,837	24.0	2.4	15.7
Complicated	51	37.3	25.5	23.5	19.6	9.8	[5]	—	—	—	—	52	36.5	1.9	25.0
All Other Diseases														
Sole or Primary	2,849	41.4	7.2	7.3	3.9	2.9	453	6.8	28.4	10.6	7.9	3,302	36.8	2.3	9.3
Sole	2,778	41.3	7.1	7.1	3.9	2.8	443	6.5	28.4	10.6	8.1	3,221	36.7	2.3	9.2
Complicated	350	54.3	11.5	16.7	4.3	2.9	45	13.0	23.9	6.5	2.2	395	48.2	1.0	12.7

[1] Cases with onset prior to the study and those still sick on the last visit are included along with completed cases, but the medicine and services refer to those received within the study year. Attended cases include all attended by either medical or nonmedical practitioners.

[2] A case is considered as complicated if another diagnosis is reported as occurring simultaneously with or as overlapping the period of sickness from the diagnosis listed, regardless of which diagnosis was classified as the primary cause of the illness. The complication may have a definite relationship to the other diagnosis (as in measles and pneumonia), or be apparently unrelated (as in measles and chickenpox). The specific diagnoses included in each broad group are shown in Table 4. For definition of diagnosis groups in terms of the International List of Causes of Death, *see* Table 1 of a preceding paper (17).

[3] Medicine dispensed by the doctor is included with doctor's prescriptions.

[4] Including seven cases where radium was used.

[5] Less than fifteen unattended cases and no percentages computed.

Considering all cases (attended and unattended) as shown in Table 3, degenerative and nervous diseases show the highest proportions of cases with medicine procured on a prescription, 60 and 59 per cent respectively; at the other extreme with low proportions are accidents with 24 per cent and female genital and puerperal with 36 per cent procuring medicine by prescription. However, when cases not attended by a doctor are eliminated, minor respiratory and minor digestive diseases show the highest proportions of attended cases with medicine procured by prescription, 69 and 67 per cent respectively; at the other extreme with low proportions are accidents with 26 per cent and female genital and puerperal diagnoses with 37 per cent of the attended cases procuring medicine by prescription. Thus, of the attended cases, the two groups of acute illnesses with a high frequency of occurrence also had a high percentage of cases which procured medicine by prescription, even though the illnesses are usually of a minor character. Among the specific minor respiratory diseases (sole diagnosis) with a high percentage of cases having a prescription are bronchitis, 78 per cent; laryngitis, 73 per cent; influenza, 71 per cent; and cough, 70 per cent. Thus, there are no one or two diagnoses which are responsible for the high minor respiratory percentage.

The specific diseases with the highest percentage of attended cases (sole diagnosis) which had medicine on a doctor's prescription were: impetigo, 86 per cent; acute rheumatism, 83 per cent; diphtheria, 81 per cent; pneumonia, 79 per cent; and intestinal parasites, 79 per cent. Of the 113 specific diseases (sole diagnosis) shown in Table 4, 9 had less than 20 per cent of the attended cases with a doctor's prescription, 23 had 20 to 39 per cent, 34 had 40 to 59 per cent, 44 had 60 to 79 per cent, and 3 diagnoses had 80 per cent or more of the attended cases with a doctor's prescription.

As noted above, medicine other than that procured on a doctor's prescription or druggist's recommendation would probably be composed rather largely of patent preparations, although it includes

Table 4. Medicine, laboratory, x-ray, and physiotherapy services received within the year of observation in connection with illnesses from specific causes—8,758 canvassed white families in eighteen States during twelve consecutive months, 1928-1931.

Disease and Whether Sole Diagnosis or Complicated by Another Disease[2]	Number of Attended Cases	Percentage of Attended Cases[1] Which Had:					Total Number of Cases	Percentage of All Cases[1] Which Had Medicine Procured for This Case:		
		Medicine Procured for This Case		One or More Kinds of Laboratory Service	X-ray Used for Diagnosis or Treatment of Case	One or More Forms of Physiotherapy		On Doctor's Prescription (New or Refilled)[3]	On Druggist's Recommendation But None on Doctor's Prescription	But None on Druggist's Recommendation or Doctor's Prescription
		On Doctor's Prescription (New or Refilled)[3]	But None on Doctor's Prescription							
Minor Respiratory Diseases										
Influenza and Grippe										
Sole	2,418	71.2	4.8	1.5	.3	.5	3,152	56.3	3.4	9.4
Complicated	156	72.3	8.4	5.2	3.2	1.3	168	67.1	3.6	7.2
Bronchitis and Chest Colds										
Sole	1,257	78.0	4.5	1.8	.8	1.4	1,801	57.3	4.4	13.8
Complicated	66	74.2	6.1	6.1	4.5	1.5	82	59.8	3.7	7.3
Coryza and Colds, Unqualified										
Sole	1,796	62.1	4.0	.7	.3	.5	3,906	32.3	7.0	16.3
Complicated	174	64.4	4.6	1.1	2.9	1.1	228	50.9	4.4	5.3
Cough										
Sole	54	70.4	3.7	3.7	—	3.7	100	49.0	12.0	12.0
Tonsillitis										
Sole	677	65.7	5.5	.9	.1	.1	841	54.0	4.6	10.0
Complicated	54	66.7	9.3	5.6	1.9	—	56	64.3	3.6	7.1
Quinsy										
Sole	62	53.2	12.9	1.6	—	1.6	66	50.0	3.0	12.1
Sore Throat										
Sole	325	62.8	5.2	.9	—	.3	621	35.4	3.7	14.5
Complicated	19	68.4	10.5	—	—	10.5	35	40.0	2.9	14.3
Other Pharynx and Tonsil Affections, Except Tonsillectomy										
Sole	127	57.5	4.7	4.7	1.6	3.9	138	53.6	.7	5.8
Complicated	34	70.6	—	11.8	11.8	2.9	35	68.6	—	—
Laryngitis										
Sole	94	73.4	2.1	2.1	1.1	1.1	104	67.3	2.9	2.9
Croup										
Sole	63	69.8	6.3	1.6	—	—	110	43.6	2.7	20.9
Other Respiratory Diseases										
Tonsillectomy and Adenoidectomy										
Sole	791	18.1	10.4	42.1	1.9	.4	791	18.1	—	10.4
Complicated	50	36.0	24.0	52.0	6.0	4.0	50	36.0	—	24.0
Pneumonia, All Forms										
Sole	238	79.0	5.5	5.0	2.9	1.3	239	78.7	.8	4.6
Complicated	77	68.8	11.7	27.3	14.3	6.5	77	68.8	1.3	10.4
Sinusitis										
Sole	324	62.3	4.0	5.6	7.7	2.5	340	60.3	.9	5.3
Complicated	54	61.1	1.9	18.5	24.1	3.7	55	60.0	—	1.8

Table 4 (Continued).

Disease and Whether Sole Diagnosis or Complicated by Another Disease[2]	Number of Attended Cases	Percentage of Attended Cases[1] Which Had:					Total Number of Cases	Percentage of All Cases[1] Which Had Medicine Procured for This Case:		
		Medicine Procured for This Case		One or More Kinds of Laboratory Service	X-ray Used for Diagnosis or Treatment of Case	One or More Forms of Physiotherapy		On Doctor's Prescription (New or Refilled)[3]	On Druggist's Recommendation, None on Doctor's Prescription	But None on Druggist's Recommendation, Doctor's Prescription
		On Doctor's Prescription (New or Refilled)[3]	But None on Doctor's Prescription							
Other Respiratory Diseases (Continued)										
Vincent's Angina										
Sole	38	44.7	18.4	7.9	—	—	38	44.7	—	18.4
Asthma										
Sole	104	77.9	6.7	6.7	—	1.9	131	66.4	9.2	7.6
Complicated	19	89.5	5.3	15.8	15.8	5.3	19	89.5	—	5.3
Hay Fever										
Sole	55	52.7	14.5	1.8	1.8	1.8	75	44.0	2.7	20.0
Pleurisy										
Sole	77	61.0	2.6	7.8	6.5	1.3	85	55.3	3.5	3.5
Complicated	28	78.6	3.6	14.3	21.4	—	29	75.9	—	3.4
Respiratory Tuberculosis										
Sole	89	44.9	10.1	25.8	34.8	3.4	92	43.5	4.3	8.7
Suspected Respiratory Tuberculosis										
Sole	38	42.1	5.3	7.9	21.1	5.3	39	41.0	—	5.1
Minor Digestive Diseases										
Indigestion, Upset Stomach, and Nausea										
Sole	880	69.2	4.3	1.6	1.3	.3	1,135	55.3	3.6	8.5
Complicated	65	73.8	4.6	3.1	3.1	—	91	53.8	2.2	12.1
Biliousness										
Sole	92	64.1	6.5	—	—	—	138	44.2	5.1	14.5
Other and Ill-Defined Stomach Diseases										
Sole	171	56.1	2.9	4.7	7.6	1.2	208	49.5	3.8	5.8
Complicated	26	69.2	7.7	3.8	11.5	—	30	63.3	6.7	10.0
Diarrhea and Enteritis										
Sole	568	65.4	4.4	1.8	1.4	.4	773	49.1	2.8	7.8
Complicated	49	59.2	12.2	4.1	4.1	—	56	51.8	5.4	8.9
Other Digestive Diseases										
Ulcers of Stomach and Duodenum										
Sole	68	72.1	5.9	16.2	35.3	—	70	71.4	1.4	5.7
Intestinal Parasites, Except Hookworm										
Sole	33	78.8	3.0	3.0	3.0	—	41	68.3	7.3	9.8
Appendicitis										
Sole	284	37.7	25.7	46.5	4.6	.7	291	36.8	.7	25.8
Complicated	60	43.3	23.3	65.0	23.3	1.7	61	42.6	1.6	23.0
Hernia, Intestinal Obstruction										
Sole	79	22.8	27.8	32.9	8.9	1.3	89	21.3	2.2	24.7
Complicated	17	47.1	23.5	47.1	11.8	—	17	47.1	—	23.5
Constipation										
Sole	54	64.8	9.3	1.9	—	1.9	82	46.3	11.0	14.6

Table 4 (Continued).

Disease and Whether Sole Diagnosis or Complicated by Another Disease[2]	Number of Attended Cases	Percentage of Attended Cases[1] Which Had:					Total Number of Cases	Percentage of All Cases[1] Which Had Medicine Procured for This Case:		
		Medicine Procured for This Case		One or More Kinds of Laboratory Service	X-ray Used for Diagnosis or Treatment of Case	One or More Forms of Physiotherapy		On Doctor's Prescription (New or Refilled)[3]	On Druggist's Recommendation But None on Doctor's Prescription	But None on Druggist's Recommendation or Doctor's Prescription
		On Doctor's Prescription (New or Refilled)[3]	But None on Doctor's Prescription							
Other Digestive Diseases (Continued)										
Biliary Calculi, Cholecystitis										
Sole	152	61.2	7.9	18.4	15.8	2.0	162	61.1	1.2	7.4
Complicated	22	50.0	13.6	45.5	31.8	—	23	47.8	—	13.0
Other and Ill-Defined Liver Diseases										
Sole	55	67.3	1.8	1.8	1.8	—	65	56.9	6.2	1.5
Diseases of the Mouth Except Teeth and Gums										
Sole	53	58.5	3.8	5.7	—	1.9	55	56.4	—	3.6
Communicable Diseases										
Measles										
Sole	568	53.5	4.4	1.1	—	—	887	38.0	2.4	5.6
Complicated	50	66.0	16.0	8.0	4.0	—	53	62.3	1.9	13.2
German Measles										
Sole	25	16.0	4.0	—	—	—	58	6.9	1.7	1.7
Whooping Cough										
Sole	506	60.5	7.9	.4	.2	1.2	708	44.2	5.2	9.5
Complicated	28	71.4	3.6	—	3.6	7.1	31	64.5	—	3.2
Chickenpox										
Sole	280	36.8	7.5	—	—	.4	578	19.7	1.0	8.5
Complicated	17	47.1	5.9	—	5.9	—	18	44.4	—	5.6
Mumps										
Sole	195	24.1	7.2	1.5	.5	—	446	13.0	.4	7.6
Complicated	16	37.5	6.3	—	—	—	20	30.0	5.0	10.0
Scarlet Fever										
Sole	200	62.5	7.0	22.5	—	—	215	58.1	.5	7.0
Complicated	15	73.3	6.7	40.0	6.7	—	15	73.3	—	6.7
Diphtheria										
Sole	68	80.9	11.8	23.5	—	—	68	80.9	1.5	10.3
Smallpox										
Sole	16	37.5	6.3	12.5	—	—	17	35.3	—	5.9
Malaria										
Sole	95	66.3	23.2	4.2	—	—	118	56.8	3.4	28.8
Erysipelas										
Sole	24	75.0	12.5	—	—	4.2	25	72.0	—	12.0
Tuberculosis, Nonrespiratory										
Sole	21	28.6	—	9.5	33.3	19.0	23	26.1	—	4.3
Local and Other Infections Not Specified as Accidental										
Sole	198	38.4	19.7	2.0	2.5	2.0	219	34.7	.5	22.4
Smallpox Vaccination										
Sole	76	10.5	10.5	1.3	—	—	76	10.5	1.3	9.2

Table 4 (Continued).

Disease and Whether Sole Diagnosis or Complicated by Another Disease[2]	Number of Attended Cases	Percentage of Attended Cases[1] Which Had:					Total Number of Cases	Percentage of All Cases[1] Which Had Medicine Procured for This Case:		
		Medicine Procured for This Case		One or More Kinds of Laboratory Service	X-ray Used for Diagnosis or Treatment of Case	One or More Forms of Physiotherapy		On Doctor's Prescription (New or Refilled)[3]	On Druggist's Recommendation But None on Doctor's Prescription	But None on Druggist's Recommendation or Doctor's Prescription
		On Doctor's Prescription (New or Refilled)[3]	But None on Doctor's Prescription							
Ear and Mastoid Diseases										
Earache										
Sole	87	46.0	3.4	—	1.1	1.1	115	36.5	2.6	7.0
Complicated	30	56.7	6.7	—	—	3.3	39	46.2	5.1	7.7
Otitis Media										
Sole	376	60.9	5.6	2.1	.3	1.1	390	59.2	.8	5.1
Complicated	126	75.4	5.6	9.5	7.1	2.4	128	75.0	—	5.5
Other Ear Diseases										
Sole	145	31.7	3.4	1.4	1.4	.7	150	31.3	1.3	4.0
Complicated	29	69.0	3.4	6.9	3.4	—	33	60.6	—	3.0
Diseases of Mastoid Process										
Sole	40	35.0	20.0	37.5	15.0	—	40	35.0	—	20.0
Nervous Diseases Except Cerebral Hemorrhage, Paralysis, Neuralgia, and Neuritis										
Nervousness										
Sole	203	63.5	4.4	3.4	1.5	3.4	220	59.1	1.4	6.8
Complicated	26	65.4	—	11.5	11.5	3.8	29	58.6	3.4	6.9
Neurasthenia, Nervous Breakdown										
Sole	103	70.9	4.9	12.6	8.7	2.9	103	70.9	1.0	3.9
Complicated	15	66.7	6.7	13.3	6.7	—	15	66.7	—	6.7
Convulsions, Unqualified										
Sole	36	58.3	—	5.6	2.8	2.8	40	55.0	—	5.0
Other Nervous Diseases Except Cerebral Hemorrhage, Paralysis, Neuralgia, and Neuritis										
Sole	103	48.5	4.9	10.7	4.9	2.9	115	47.8	.9	6.1
Complicated	22	54.5	—	31.8	13.6	—	26	50.0	3.8	—
Rheumatism and Related Diseases										
Acute Rheumatic Fever										
Sole	29	82.8	6.9	—	—	3.4	32	75.0	6.3	9.4
Chronic Rheumatism and Arthritis										
Sole	114	51.8	8.8	6.1	10.5	14.9	141	43.3	4.3	12.8
Complicated	29	69.0	6.9	34.5	27.6	17.2	31	67.7	—	6.5
Rheumatism, Unqualified										
Sole	187	66.8	4.8	3.7	1.6	8.0	204	62.3	2.0	7.8
Complicated	23	65.2	8.7	21.7	—	4.3	25	60.0	4.0	4.0
Neuralgia and Neuritis										
Sole	205	54.1	8.8	3.9	7.3	10.7	235	48.1	.9	11.9
Complicated	29	75.9	10.3	10.3	10.3	10.3	34	67.6	—	14.7

Table 4 (Continued).

Disease and Whether Sole Diagnosis or Complicated by Another Disease[2]	Number of Attended Cases	Percentage of Attended Cases[1] Which Had:					Total Number of Cases	Percentage of All Cases[1] Which Had Medicine Procured for This Case:		
		Medicine Procured for This Case		One or More Kinds of Laboratory Service	X-ray Used for Diagnosis or Treatment of Case	One or More Forms of Physiotherapy				
		On Doctor's Prescription (New or Refilled)[3]	But None on Doctor's Prescription					On Doctor's Prescription (New or Refilled)[3]	On Druggist's Recommendation But None on Doctor's Prescription	But None on Druggist's Recommendation or Doctor's Prescription
Rheumatism and Related Diseases (Cont'd)										
Lumbago										
Sole	106	56.6	4.7	1.9	.9	4.7	122	50.0	4.1	8.2
Myalgia and Myositis										
Sole	32	6.3	6.3	3.1	—	3.1	35	5.7	2.9	8.6
Degenerative Diseases										
Cancer, All Sites										
Sole	42	40.5	11.9	45.2	38.1	7.1	42	40.5	—	11.9
Benign Tumors, Except of Female Organs										
Sole	113	15.0	14.2	10.6	10.6	5.3	114	14.9	—	14.0
Diabetes										
Sole	53	62.3	17.0	54.7	3.8	—	57	59.6	3.5	15.8
Diseases of the Heart										
Sole	190	72.6	5.3	11.1	6.3	1.1	205	68.8	.5	5.4
Complicated	123	74.0	7.3	12.2	4.9	.8	131	71.0	3.1	5.3
Arteriosclerosis and High Blood Pressure										
Sole	110	74.5	1.8	9.1	1.8	1.8	111	74.8	.9	.9
Complicated	74	77.0	5.4	16.2	5.4	2.7	74	77.0	1.4	4.1
Cerebral Hemorrhage and Paralysis										
Sole	27	51.9	7.4	22.2	14.8	14.8	33	42.4	—	15.2
Complicated	32	59.4	6.3	6.3	6.3	—	32	59.4	—	6.3
Varicose Veins or Ulcer										
Sole	41	53.7	17.1	4.9	—	4.9	44	50.0	—	15.9
Nephritis, Acute and Chronic										
Sole	46	60.9	8.7	15.2	4.3	—	47	61.7	—	8.5
Complicated	33	75.8	3.0	12.1	—	—	33	75.8	—	3.0
Other and Unspecified Kidney Diseases Except Pyelitis										
Sole	130	67.7	4.6	22.3	9.2	.8	140	65.0	2.1	6.4
Complicated	35	65.7	8.6	17.1	2.9	—	44	54.5	2.3	15.9
Cystitis, and Calculi of Urinary Passages										
Sole	131	73.3	1.5	17.6	9.2	.8	134	72.4	—	1.5
Complicated	24	87.5	—	29.2	16.7	8.3	24	87.5	—	—
Other Diseases of Bladder										
Sole	61	65.6	3.3	11.5	1.6	4.9	64	64.1	4.7	—
Disease of the Prostate										
Sole	22	40.9	4.5	27.3	13.6	4.5	22	40.9	—	4.5
Skin Diseases										
Furuncle										
Sole	240	45.8	12.9	1.7	1.3	—	307	36.2	6.2	16.9

Table 4 (Continued).

Disease and Whether Sole Diagnosis or Complicated by Another Disease[2]	Number of Attended Cases	Percentage of Attended Cases[1] Which Had:					Total Number of Cases	Percentage of All Cases[1] Which Had Medicine Procured for This Case:		
		Medicine Procured for This Case		One or More Kinds of Laboratory Service	X-ray Used for Diagnosis or Treatment of Case	One or More Forms of Physiotherapy				
		On Doctor's Prescription (New or Refilled)[3]	But None on Doctor's Prescription					On Doctor's Prescription (New or Refilled)[3]	On Druggist's Recommendation But None on Doctor's Prescription	But None on Druggist's Recommendation or Doctor's Prescription
Skin Diseases (Continued)										
Abscesses and Ulcers										
Sole	112	36.6	14.3	1.8	1.8	1.8	116	37.1	1.7	12.9
Impetigo										
Sole	110	86.4	1.8	—	—	.9	138	75.4	1.4	8.0
Urticaria										
Sole	56	64.3	1.8	3.6	—	3.6	62	58.1	3.2	3.2
Scabies										
Sole	74	73.0	14.9	1.4	—	2.7	106	58.5	4.7	16.0
Eczema										
Sole	140	77.9	7.1	4.3	1.4	7.9	154	71.4	3.9	9.7
Other and Ill-Defined Skin Diseases										
Sole	402	54.0	6.0	1.7	4.2	6.5	446	49.8	3.8	7.6
Complicated	18	44.4	27.8	11.1	5.6	—	19	42.1	5.3	21.1
Female Genital and Puerperal Diagnoses										
Cysts and Tumors of Ovary and Uterus										
Sole	33	33.3	24.2	45.5	12.1	3.0	33	33.3	6.1	18.2
Salpingitis and Pelvic Abscess										
Sole	17	58.8	17.6	47.1	11.8	—	17	58.8	—	17.6
Complicated	15	53.3	20.0	46.7	6.7	—	15	53.3	—	20.0
Menstrual Disorders										
Sole	185	72.4	2.2	2.7	.5	.5	212	64.2	1.4	6.1
Complicated	17	76.5	5.9	5.9	11.8	5.9	19	68.4	—	5.3
Other and Ill-Defined Nonvenereal Diseases of Female Organs, Including Chronic Results of Childbirth										
Sole	228	45.2	11.4	14.9	3.9	3.5	242	42.6	.4	12.4
Complicated	77	42.9	14.3	37.7	10.4	2.6	80	41.3	1.3	15.0
Acute Complications of Pregnancy and Childbirth										
Sole	37	48.6	5.4	16.2	—	—	37	48.6	—	5.4
Complicated	26	42.3	23.1	46.2	—	—	26	42.3	—	23.1
Abortions, Miscarriages, and Stillbirths										
Sole	132	47.7	21.2	25.8	.8	3.8	136	46.3	2.9	20.6
Live Births										
Sole	732	20.8	37.0	35.8	.4	.1	735	20.7	.7	36.3
Complicated	26	38.5	34.6	50.0	3.8	—	26	38.5	—	34.6
Puerperal Diseases of the Breast										
Sole	33	39.4	9.1	—	3.0	—	33	39.4	—	9.1
Accidental Injuries										
Poisoning by Ivy, Oak, and Other Plants										
Sole	69	71.0	4.3	—	1.4	—	96	56.3	12.5	6.3

Table 4 (Continued).

Disease and Whether Sole Diagnosis or Complicated by Another Disease[1]	Number of Attended Cases	Percentage of Attended Cases[1] Which Had:					Total Number of Cases	Percentage of All Cases[1] Which Had Medicine Procured for This Case:		
		Medicine Procured for This Case		One or More Kinds of Laboratory Service	X-ray Used for Diagnosis or Treatment of Case	One or More Forms of Physiotherapy		On Doctor's Prescription (New or Refilled)[2]	On Druggist's Recommendation But None on Doctor's Prescription	But None on Druggist's Recommendation or Doctor's Prescription
		On Doctor's Prescription (New or Refilled)[2]	But None on Doctor's Prescription							
Accidental Injuries (Continued)										
Other Accidental Poisonings										
Sole	105	50.5	5.7	1.0	—	—	117	45.3	.9	6.0
Automobile Accidents										
Sole	180	20.0	22.2	8.9	26.1	3.3	189	19.0	.5	21.7
Accidental Burns										
Sole	101	48.5	17.8	—	—	—	152	32.2	11.2	28.9
Accidental Injuries by Cutting or Piercing Instruments										
Sole	247	21.5	17.0	.8	2.8	.4	288	18.4	1.4	19.4
Accidental Falls										
Sole	173	22.4	10.3	3.4	20.7	5.2	191	20.3	3.6	11.5
Eye Accidents										
Sole	115	30.4	5.2	2.6	.9	—	118	29.7	—	5.9
Injuries by Animals										
Sole	45	22.2	4.4	2.2	2.2	—	51	20.0	—	10.0
All Other Accidents										
Sole	1,516	22.8	14.7	2.2	17.9	2.4	1,635	21.5	1.6	15.8
Complicated	31	35.5	22.6	25.8	22.6	6.5	32	34.4	3.1	21.9
All Other Diseases										
Anemia, All Forms										
Sole	106	77.4	2.8	14.2	5.7	3.8	114	75.4	.9	5.3
Complicated	32	71.9	3.1	28.1	9.4	3.1	32	71.9	—	3.1
Diseases of Thyroid Gland										
Sole	105	67.6	8.6	28.6	1.9	1.9	113	62.6	1.7	9.6
Complicated	19	68.4	5.3	31.6	10.5	5.3	21	61.9	—	14.3
Acidosis										
Sole	59	72.9	3.4	10.2	—	1.7	62	72.6	1.6	1.6
Sty										
Sole	50	36.0	8.0	—	—	—	61	29.5	—	9.8
Conjunctivitis, Pink-eye, Sore Eye										
Sole	144	59.0	5.6	1.4	—	—	199	44.7	2.5	8.5
Other Eye Diseases										
Sole	153	45.8	4.6	9.2	3.9	.7	159	44.0	2.5	3.8
Complicated	17	58.8	17.6	23.5	5.9	5.9	17	58.8	—	17.6
Hemorrhoids										
Sole	89	55.1	11.2	6.7	—	2.2	100	50.0	7.0	11.0
Diseases of Lymphatic System										
Sole	150	56.0	11.3	3.3	1.3	2.0	171	51.5	3.5	10.5
Complicated	48	39.6	6.3	6.3	2.1	2.1	61	32.8	—	4.9

Table 4 (Continued).

Disease and Whether Sole Diagnosis or Complicated by Another Disease[2]	Number of Attended Cases	Percentage of Attended Cases[1] Which Had:					Total Number of Cases	Percentage of All Cases[1] Which Had Medicine Procured for This Case:		
		Medicine Procured for This Case		One or More Kinds of Laboratory Service	X-ray Used for Diagnosis or Treatment of Case	One or More Forms of Physiotherapy		On Doctor's Prescription (New or Refilled)[3]	On Druggist's Recommendation But None on Doctor's Prescription	But None on Druggist's Recommendation or Doctor's Prescription
		On Doctor's Prescription (New or Refilled)[3]	But None on Doctor's Prescription							
All Other Diseases (Continued)										
Diseases of the Teeth and Gums										
Sole	365	21.6	7.7	.8	1.6	.5	395	20.0	2.3	8.4
Complicated	44	52.3	11.4	4.5	—	—	53	43.4	5.7	11.3
Pyelitis										
Sole	80	77.5	2.5	41.3	5.0	—	81	76.5	—	3.7
Circumcision										
Sole	80	8.7	18.7	5.0	—	—	80	8.7	—	18.7
Complicated	15	33.3	53.3	60.0	6.7	6.7	15	33.3	—	53.3
Diseases of Bones and Joints, Except Tuberculosis and Rheumatism										
Sole	69	33.3	11.6	14.5	24.6	11.6	73	31.5	—	13.7
Ill-Defined Orthopedic Conditions and Diseases of the Organs of Locomotion, Except Lumbago, Myalgia and Myositis										
Sole	165	11.5	15.8	5.5	9.7	10.9	175	11.4	1.1	15.4
Congenital Malformations and Diseases of Early Infancy										
Sole	69	13.0	7.2	4.3	5.8	—	69	13.0	1.4	5.8
Complicated	15	—	—	6.7	—	6.7	15	—	—	—
Foot Trouble										
Sole	102	—	2.9	—	—	—	104	—	1.0	1.9
Headache										
Sole	109	54.1	2.8	.9	2.8	—	234	28.2	3.4	18.4
Backache										
Sole	83	20.5	2.4	—	2.4	3.6	102	16.7	4.9	8.8
Debility, Fatigue, Exhaustion, Malnutrition, Loss of Weight										
Sole	182	52.7	6.0	5.5	3.3	4.9	233	42.9	6.0	9.9
Complicated	22	54.5	4.5	9.1	4.5	4.5	22	54.5	—	4.5
Rash, Unqualified										
Sole	83	53.0	1.2	1.2	4.8	—	93	48.4	3.2	4.3

[1] This table shows data for all sole and all complicated diagnoses with 15 or more attended cases. Cases with onset prior to the study and those still sick on the last visit are included along with completed cases, but the medicine and services refer to those received within the study year. Attended cases include all attended by either medical or nonmedical practitioners.

[2] A case is considered as complicated if another diagnosis is reported as occurring simultaneously with or as overlapping the period of sickness from the diagnosis listed, regardless of which diagnosis was classified as the primary cause of the illness. The complication may have a definite relationship to the other diagnosis (as in measles and pneumonia), or be apparently unrelated (as in measles and chickenpox). For definition of diagnoses in terms of the International List of Causes of Death, *see* Table 2 of a preceding paper (17).

[3] Medicine dispensed by the doctor is included with doctor's prescriptions.

dressings and also medicines recommended by a doctor without a written prescription. Of the 113 specific diseases (sole diagnosis) included in Table 4, 19 diagnoses had less than 5 per cent of all cases with medicine of this type only, 47 diagnoses had 5 to 9 per cent, 22 had 10 to 14 per cent, 14 had 15 to 19 per cent, and 11 diagnoses had 20 per cent or more of all cases which had only medicine purchased by other means than on a doctor's prescription or a druggist's recommendation. Thus, it appears that the use of patent medicines and other items in this category of "other medicine" as the sole preparations for the treatment of illness is confined to a relatively small number of cases of a great many different diagnoses, rather than being used in the treatment of a high percentage of cases of a few diagnoses. In other words, the 113 diagnoses distributed according to the proportion of cases that had a doctor's prescription run rather evenly from 30 to 80 per cent, but the distribution of cases according to "other medicine only" is concentrated largely under 20 per cent. The diagnoses with the highest percentages of cases (sole diagnosis) with "other medicine" (including dressings and unwritten recommendations by doctors) are deliveries with live birth, 36 per cent; burns, 29 per cent; malaria, 29 per cent; appendicitis, 26 per cent; and hernia and intestinal obstruction, 25 per cent.

Table 5 shows for the 46 specific diseases with 15 or more unattended cases (sole diagnosis) the percentage using medicine from the home supply of nonprescription preparations and the percentage procuring medicine for the specific case by the several methods, including the refilling of a doctor's prescription. Of these unattended cases, the highest percentage is usually for medicine without a druggist's recommendation or a doctor's prescription, but the percentage procuring medicine on a druggist's recommendation is fairly high for many diagnoses also.

The use of doctors' prescriptions may be considered from the point of view of the diagnosis distribution of the pharmacist's case

Table 5. Medicine procured within the year of observation in connection with illnesses from specific diagnoses that were not attended by a doctor—8,758 canvassed white families in eighteen States during twelve consecutive months, 1928-1931. (Sole diagnosis only.)

Disease	Number of Unattended Cases	Percentage of Unattended Cases[1] Which Had:			
		No Medicine Procured But Used Home Supply[2]	Medicine Procured for This Case:		
			But None on Druggist's Recommendation or Doctor's Prescription	On Druggist's Recommendation But None on Doctor's Prescription	By Refilling of Doctor's Prescription
Influenza and Grippe	734	15.4	25.7	13.1	7.1
Bronchitis and Chest Colds	544	9.7	36.8	13.4	9.4
Coryza and Colds, Unqualified	2,110	13.2	27.0	12.7	6.7
Cough	46	—	23.9	23.9	23.9
Tonsillitis	164	14.6	29.9	22.6	5.5
Sore Throat	296	10.1	25.0	7.4	5.4
Croup	47	21.3	40.4	6.4	8.5
Sinusitis	16	6.3	37.5	12.5	18.7
Asthma	27	7.4	22.2	33.3	22.2
Hay Fever	20	—	35.0	10.0	20.0
Indigestion, Upset Stomach, and Nausea	255	14.1	25.9	13.3	7.5
Biliousness	46	10.9	30.4	15.2	4.3
Other and Ill-Defined Stomach Diseases	37	8.1	18.9	21.6	18.9
Diarrhea and Enteritis	205	9.8	18.0	9.8	3.9
Constipation	28	10.7	32.1	25.0	10.7
Measles	319	11.0	8.5	6.0	10.3
German Measles	33	—	3.0	—	—
Whooping Cough	202	7.9	19.3	12.4	3.5
Chickenpox	298	6.4	9.7	1.7	3.7
Mumps	251	8.8	8.0	.8	4.4
Scarlet Fever	15	—	13.3	—	—
Malaria	23	13.0	52.2	17.4	17.4
Local & Other Infec. Not Spec. as Accid.	21	9.5	47.6	4.8	—
Earache	28	14.3	17.9	10.7	7.1
Nervousness	17	17.6	35.3	17.6	5.9
Chronic Rheumatism and Arthritis	27	7.4	33.3	18.5	7.4
Rheumatism, Unqualified	17	5.9	47.1	17.6	11.8
Neuralgia and Neuritis	30	16.7	36.7	3.3	6.7
Lumbago	16	12.5	43.7	18.7	6.3
Diseases of the Heart	15	—	13.3	—	20.0
Furuncle	67	7.5	37.3	22.4	1.5
Impetigo	28	—	32.1	7.1	32.1
Scabies	32	9.4	28.1	6.3	25.0
Other and Ill-Defined Skin Diseases	44	6.8	34.1	27.3	11.4
Menstrual Disorders	27	7.4	37.0	7.4	7.4
Poisoning by Ivy, Oak, and Other Plants	27	11.1	14.8	40.7	18.5
Accidental Burns	51	7.8	56.9	27.5	—
Accid. Injuries by Cut. or Pierc. Instruments	41	17.1	41.5	2.4	—
Accidental Falls	18	11.1	33.3	27.8	—
All Other Accidents	119	8.4	38.7	13.4	5.0
Conjunctivitis, Pink-Eye, Sore Eye	55	1.8	16.4	9.1	7.3
Diseases of Lymphatic System	21	14.3	28.6	4.8	19.0
Diseases of the Teeth and Gums	30	10.0	36.7	10.0	—
Headache	125	5.6	32.0	6.4	5.6
Backache	19	5.3	42.1	21.1	—
Debility, Fatigue, Exhaust., Malnu., Loss of Wt.	51	2.0	23.5	27.5	7.8

[1] This table shows data for all diagnoses shown in Table 4, which had 15 or more unattended cases; "other stomach", "other skin", and "other accidents" are other than the separate groups shown in Table 4 and not other than those shown here. Cases with onset prior to the study and those still sick on the last visit are included along with completed cases, but the medicine refers to that procured within the study year.

[2] Home supply refers to medicines not originating from prescriptions and not procured

load. Of the 14,184 cases which procured medicine by prescription, 37.4 per cent were minor respiratory diseases. Communicable diseases were second, accounting for 9.4 per cent; minor digestive third, 8.6 per cent; major respiratory fourth, 6.5 per cent; and degenerative diseases fifth with 5.1 per cent.

Of the 1,239[38] cases which procured some medicine on a druggist's recommendation, 50.5 per cent were minor respiratory diseases; 8.6 per cent were communicable; 6.9 per cent were minor digestive diseases; 6.1 per cent were accidental injuries; and 5.5 per cent were skin diseases.

Of the 3,847 cases whose only medicine was procured by some method other than a doctor's prescription or a druggist's recommendation, 37.5 per cent were minor respiratory diseases, 11.9 per cent were accidental injuries, 9.6 per cent were female genital or puerperal diagnoses, 8.8 per cent were communicable, and 5.1 per cent were minor digestive.

Of the 794 unattended cases reported as using home remedies or medicine from a home supply not originating in prescriptions, 66.1 per cent were minor respiratory diseases, 12.5 per cent were communicable, 8.2 per cent were minor digestive, 3.5 per cent were accidental injuries, and 1.5 per cent were skin diseases.

To summarize, the minor respiratory diseases are the most frequent cause for procuring medicine of all of the various types; communicable diseases, minor digestive diseases, and accidents are also important among the diseases that lead to the purchase of medicine. It must be remembered, however, that these statements are based on numbers of cases with one or more prescriptions, rather than on total prescriptions.

Special Services. Considering broad groups of diseases, major digestive and female genital and puerperal diagnoses had the highest percentages of attended cases with one or more laboratory ser-

[38] Includes 207 cases for which medicine was procured by doctor's prescription as well as on druggist's recommendation.

vices, 27 per cent for each group. At the other extreme were minor digestive and minor respiratory diseases with 1.9 and 1.5 per cent, respectively.

Of the 113 diseases (sole diagnosis) included in Table 4, 13 had no cases with laboratory service and 50 other diagnoses had less than 5 per cent of the attended cases with laboratory service, 17 had 5 to 9 per cent, 15 had 10 to 19 per cent, 11 had 20 to 39 per cent, and only 7 had 40 per cent or more of the cases with laboratory service. The diagnoses with the highest proportions of cases (sole diagnosis) with laboratory service were: diabetes, 55 per cent; salpingitis and pelvic abscess, 47 per cent; appendicitis, 47 per cent; female genital tumors, 45 per cent; and cancer, 45 per cent. As already noted, the percentage with laboratory service should be considered a minimum or an understatement because of the incompleteness of family reports.

From the point of view of what diagnoses contribute the maximum number of cases to the laboratory case load, the line-up is quite different. Of the 1,976 cases with one or more laboratory services, 28.4 per cent were respiratory diseases (5.4 for minor and 23.0 for other respiratory). Other diseases which contributed heavily to the total of 1,976 cases with laboratory service were female genital and puerperal diagnoses, 20.3 per cent; major digestive diseases, 13.0 per cent; degenerative diseases, 10.3 per cent; and communicable diseases, 6.2 per cent of the total cases with laboratory service. In some of these broad groups there were one or two diagnoses that contributed the great majority of cases with laboratory service. Among these are tonsillectomy with 18.0 per cent of the total of 1,976 cases with laboratory service; deliveries (including abortions) with 15.8 per cent; and appendicitis with 7.8 per cent of the total cases with laboratory service.

The data of the present study did not permit the separation of x-ray used in diagnosis from that used in the treatment of disease. The broad disease groups with the highest proportions of attended

cases with x-ray service were accidents, 14.3 per cent, and major digestive diseases, 10.1 per cent; the lowest proportions with x-ray were for communicable diseases, 0.8 per cent, and minor respiratory diseases, 0.5 per cent. The specific diseases (sole diagnosis) in which the highest proportions of cases were reported as having had x-ray service were: cancer, 36 per cent; ulcer of the stomach and duodenum, 35 per cent; respiratory tuberculosis, 35 per cent; nonrespiratory tuberculosis, 33 per cent; and automobile accidents, 26 per cent.

Of the total of 113 specific diseases (sole diagnosis), 33 diagnoses had no cases in which x-ray was used and 50 others had less than 5 per cent of the attended cases with x-ray; 22 diagnoses had from 5 to 19 per cent, and only 8 diagnoses had 20 per cent or more of the attended cases with x-ray service used either in the diagnosis or treatment of the case.

The matter may be considered from the point of view of what diagnoses contribute the maximum numbers of cases to the x-ray technician's load. Of the 1,007 cases which had x-ray for the diagnosis or treatment of the illness, 36.9 per cent of the total cases were accidents, 11.7 per cent were major respiratory, 9.7 per cent were degenerative, and 9.4 per cent were major digestive diseases. Various specific types of accidents were reported as having rather large percentages with x-ray, but presumably the important factor is fracture or the examination of the patient for possible fracture. In the major respiratory group (118 cases), tuberculosis with 45 cases with x-ray, and sinusitis with 28 cases are among the heavier contributors; in the major digestive group (95 cases), the following diagnoses were all fairly important: gallbladder diseases, 29 cases with x-ray; ulcer of the stomach and duodenum, 28 cases; and appendicitis 21 cases. In the degenerative group cancer and tumor contributed 33 of the 98 cases with x-ray, and kidney and urinary diseases (except pyelitis) contributed 30 cases.

Of the broad diagnosis groups, rheumatic diseases (including neuralgia and neuritis) had the highest proportion of cases with

some form of physiotherapy, 9.2 per cent, followed by nervous diseases with 3.0 per cent. Minor digestive and minor respiratory had the smallest proportions of cases so treated, with 0.4 and 0.8 per cent, respectively. Among the more specific diseases (sole diagnosis) with the highest percentages of cases with physiotherapy were nonrespiratory tuberculosis, 19.0 per cent; chronic rheumatism and arthritis, 14.9 per cent; cerebral hemorrhage and the resulting paralysis, 14.8 per cent; bone and joint diseases, 11.6 per cent; and miscellaneous other orthopedic conditions, 10.9 per cent. Of the 113 diseases (sole diagnosis) shown in Table 4, 34 diagnoses had no cases with physiotherapy, and 38 more had less than 2 per cent so treated, 28 diagnoses had 2 to 4 per cent, 7 had 5 to 9 per cent, 5 had 10 to 14 per cent, and only 1 diagnosis had 15 or more per cent of the cases with physiotherapy.

From the point of view of the physiotherapist's case load, it may be noted that in spite of the small percentage of respiratory cases with physiotherapy, respiratory diseases contributed 19.8 per cent of the total of 444 cases which had physiotherapy (13.0 for minor and 6.8 for other respiratory). Other disease groups of importance in the physiotherapist's load are: rheumatic diseases with 14.4 per cent of the total, and accidents with 12.8 per cent of the total with physiotherapy.

Specific Kinds of Laboratory and Physiotherapy Service Rendered for Broad Disease Groups

In nearly one-fourth of the cases recorded as having laboratory service, the specific kinds of services were not recorded; therefore, it is not feasible to compute the percentage of cases which had a specific laboratory procedure. In Table 6 all cases with laboratory service of an unspecified type have been eliminated; among those with known kinds of services the table shows what percentage had urinalysis, Wassermann or other test for syphilis, and other types of laboratory procedures of as many specific kinds as were reported.

Considering the 1,520 cases of all diagnoses which had one or more laboratory services of known type, 80.5 per cent had urinalyses, 35.7 had some type of blood test not specified as a test for syphilis, 7.5 per cent a Wasserman or other syphilis test, 3.0 per cent had a metabolism test, 3.0 a sputum examination, 1.9 a throat culture, 1.6 a pathological examination of some tissue, 1.1 an analysis of stomach contents, 0.9 a spinal fluid examination, 0.8 per cent had skin tests of some kind, 0.7 an examination of faeces, with only 1.4 per cent reporting some other type of laboratory service. These per-

Table 6. Specific kinds of laboratory service received in connection with illnesses from broad groups of causes—8,758 canvassed white families in eighteen States during twelve consecutive months, 1928-1931. (Sole or primary causes only.)

Diagnosis Group [1]	Number of Cases With One or More Known Kinds[2] of Laboratory Service	Percentage[3] of Cases With Known Kinds of Laboratory Service That Had:											
		Urinalysis	Wassermann Test	Other Blood Tests and Analyses	Spinal Fluid Examination	Throat Culture	Sputum Examination	Stomach Analysis	Stool Examination	Pathological Examination	Skin Tests	Metabolism Test	Other Known Kinds
ll Causes	1,520	80.5	7.5	35.7	.9	1.9	3.0	1.1	.7	1.6	.8	3.0	1.4
linor Respiratory Diseases	101	68.3	4.0	19.8	1.0	6.9	12.9	—	1.0	—	—	2.0	3.0
ther Respiratory Diseases	312	68.6	2.9	55.8	.6	1.3	7.4	.3	.3	.3	2.6	1.3	.3
linor Digestive Diseases	28	78.6	10.7	21.4	—	—	—	10.7	3.6	—	—	—	3.6
ther Digestive Diseases	190	88.9	2.6	60.5	—	—	.5	4.7	1.1	2.6	—	—	—
ommunicable Diseases	107	78.5	9.3	12.1	2.8	10.3	1.9	.9	1.9	.9	—	.9	2.8
ar and Mastoid Diseases	20	90.0	5.0	50.0	—	—	—	—	—	—	—	—	—
ervous Diseases Except Cerebral Hemorrhage, Paralysis, Neuralgia, and Neuritis	31	74.2	38.7	45.2	12.9	—	6.5	—	—	—	—	6.5	—
heumatism and Related Diseases	27	88.9	22.2	22.2	3.7	—	—	—	—	—	—	7.4	3.7
egenerative Diseases	165	83.6	6.1	26.1	1.2	—	.6	.6	.6	4.2	.6	4.2	3.0
in Diseases	20	55.0	25.0	20.0	—	—	—	—	5.0	—	10.0	10.0	—
emale Genital and Puerperal Diagnoses	303	96.0	10.2	18.5	—	.3	—	—	—	2.6	—	.7	1.3
ccidental Injuries	49	85.7	2.0	42.9	2.0	—	—	—	—	4.1	—	—	2.0
ll Other Diseases	167	71.3	10.2	35.9	—	3.6	1.8	.6	1.2	—	.6	13.8	1.2

[1] For specific diseases included in each broad group, *see* Table 4.
[2] Excludes 456 cases with laboratory service of unknown kind.
[3] When the same case had two or more kinds of laboratory service, each kind is counted but the case counts only once in the total; therefore, the percentages usually add to more than 100.

centages add to much more than 100 because many of the cases had more than one type of laboratory service.

In all of the diagnosis groups shown in Table 6, urinalysis is by far the most frequent type of laboratory service, ranging from 55 per cent for skin diseases with any type of laboratory service to 96 per cent for female genital and puerperal diagnoses with laboratory service.

Table 7 shows similar data for cases with physiotherapy. Of the total of 434 cases for which some known type of physiotherapy was recorded, 55 per cent reported ultra-violet or some other form of light treatments, 19 per cent electrotherapy, 17 per cent massage, and 14 per cent reported hydrotherapy. Miscellaneous other types of physiotherapy amounted to only 4 per cent of the cases that had one or more kinds of physiotherapy.

Table 7. Specific kinds of physiotherapy received in connection with illnesses from broad groups of causes—8,758 canvassed white families in eighteen States during twelve consecutive months, 1928-1931. (Sole or primary causes only.)

Diagnosis Group[1]	Number of Cases With One or More Known Kinds[2] of Physiotherapy	Percentage[3] of Cases With Known Kinds of Physiotherapy That Had:				
		Ultraviolet or Other Light Treatments	Electro-therapy	Hydro-therapy	Mas-sage	Other Known Kinds
All Causes	434	55.3	19.1	14.3	17.1	3.7
Minor Respiratory Diseases	58	72.4	10.3	12.1	6.9	1.7
Other Respiratory Diseases	27	74.1	11.1	7.4	7.4	3.7
Communicable Diseases	22	72.7	13.6	—	18.2	4.5
Rheumatism and Related Diseases	61	37.7	27.9	31.1	21.3	1.6
Degenerative Diseases	30	43.3	30.0	20.0	20.0	—
Skin Diseases	44	79.5	18.2	2.3	4.5	—
Accidental Injuries	57	49.1	21.1	10.5	28.1	5.3

[1] Includes all of the broad diagnosis groups with twenty or more cases with known kinds of physiotherapy. For all thirteen broad groups, *see* Table 3; for specific diseases included in each broad group, *see* Table 4.

[2] Excludes ten cases with physiotherapy of unknown kind.

[3] When the same case had two or more kinds of physiotherapy, each kind is counted but the case counts only once in the total; therefore, the percentages usually add to more than 100.

Variation in Doctors' Prescriptions, Other Medicine, and Special Services with Size of City and Family Income

Medicines. The percentage of cases attended by a physician varied for urban and rural areas and as a result one would expect variation in the percentage with doctors' prescriptions. Table 8 shows data on medicines procured, classified according to size of city. In rural areas 64 per cent of all cases were attended by a doctor, 72 per cent in towns under 5,000, and about 84 per cent in the two groups of cities. Comparing the rural areas with cities over 100,000, these differences are quite consistent in the three broad age groups.

The proportion of all cases that had a doctor's prescription varied from 32 per cent in rural areas to 51 in cities over 100,000. This variation does not seem to be due entirely to differences in attendance by physicians; the proportion of attended cases that had a doctor's prescription varied from 48 per cent in the rural areas to 59 in cities over 100,000.

The practice of procuring medicine on the recommendation of a druggist appears to be less common in small towns and rural areas than in large cities. Of all cases in rural areas, 2.5 per cent were reported as using medicine procured on the recommendation of a druggist (with none on doctor's prescription), as compared with 4.6 in cities over 100,000. Smaller cities and towns reported about the same percentages as rural areas. The purchase of medicine other than by doctor's prescription or druggist's recommendation was less frequent in cities; in rural areas 14 per cent of the cases had medicine of this kind only, as compared with 10 and 11 per cent in the two city groups.

Table 9 shows similar data for cases classified according to family income[37]. The proportion of cases attended by a doctor increases con-

[37] The data were also classified by income for each of the four city-rural groups; the percentage of illnesses attended by a doctor in these twenty categories may be summarized as follows: (a) The lowest proportion attended was 59 per cent for rural families with less than $1,200 annual income, as compared with 76 per cent for families of the same income

(Continued on page 378)

Table 8. Medicine procured by doctor's prescription[1] and by other methods for illness from all causes in cities of different sizes and in rural areas—8,758 canvassed white families in eighteen States during twelve consecutive months, 1928-1931.

Size of City	All Ages[2]	Under 20	20–44	45 and Over	All Ages[2]	Under 20	20–44	45 and Over
	Percentage of all cases that had medicine procured on doctor's prescription[1]				Percentage of attended cases that had medicine procured on doctor's prescription[1]			
Cities of 100,000 or Over	51.2	51.0	51.1	52.1	59.3	59.9	57.6	61.4
Cities 5,000–100,000	44.8	42.9	47.2	46.3	51.3	50.8	52.4	50.6
Towns Under 5,000	37.2	34.9	37.5	45.5	49.1	48.5	46.4	57.4
Rural Areas	32.0	28.1	36.0	37.9	47.9	45.4	47.2	56.1
	Percentage of all cases that had medicine procured on druggist's recommendation but none on doctor's prescription				Percentage of all cases that were attended[3] by any practitioner			
Cities of 100,000 or Over	4.6	4.7	4.1	5.3	83.4	81.8	86.2	82.6
Cities 5,000–100,000	2.5	2.3	2.7	2.5	84.1	81.0	87.7	88.1
Towns Under 5,000	2.1	2.1	2.2	2.2	72.3	67.7	78.4	75.7
Rural Areas	2.5	2.8	1.6	3.3	64.4	59.1	73.7	65.5
	Percentage of all cases that had medicine procured only by methods other than doctor's prescription or druggist's recommendation				Total number of attended[3] cases			
Cities of 100,000 or Over	11.4	10.4	12.9	11.2	9,628	4,757	3,393	1,417
Cities 5,000–100,000	9.5	9.1	10.7	8.0	7,340	3,797	2,571	952
Towns Under 5,000	13.5	11.6	16.2	14.5	5,143	2,577	1,772	774
Rural Areas	13.8	13.5	14.2	14.1	3,458	1,709	1,115	622
	Percentage of all cases that had any medicine procured by any method				Total number of all cases			
Cities of 100,000 or Over	67.2	66.2	68.2	68.6	11,540	5,812	3,935	1,717
Cities 5,000–100,000	56.8	54.3	60.6	56.9	8,731	4,697	2,930	1,081
Towns Under 5,000	52.8	48.6	55.9	62.2	7,111	3,804	2,259	1,021
Rural Areas	48.3	44.4	51.7	55.3	5,370	2,888	1,512	949

[1] Medicine procured on doctor's prescription includes new and refilled prescriptions and also medicine furnished by the doctor.
[2] All ages includes a few of unknown age.
[3] Attended cases include those attended by medical and nonmedical practitioners, hospitals, and clinics but not cases attended only by a nurse or laboratory attendant.

Table 9. Medicine procured by doctor's prescription and by other methods for illness from all causes among families of different income levels—8,758 canvassed white families in eighteen States during twelve consecutive months, 1928-1931.

Annual Family Income	All Ages[2]	Under 20	20–44	45 and Over	All Ages[2]	Under 20	20–44	45 and Over
	Percentage of all cases that had medicine procured on doctor's prescription[1]				Percentage of attended cases that had medicine procured on doctor's prescription[1]			
Under $1,200	35.9	32.9	38.1	41.9	51.5	50.3	48.5	60.9
$1,200 But Under $2,000	42.6	41.5	43.5	46.3	54.9	55.5	52.4	60.7
$2,000 But Under $3,000	46.7	44.8	50.0	46.3	56.4	55.6	57.5	56.2
$3,000 But Under $5,000	45.8	43.4	45.4	53.1	53.8	52.0	52.1	62.0
$5,000 and Over	45.2	43.5	46.9	46.8	48.2	47.1	49.3	49.7
	Percentage of all cases that had medicine procured on druggist's recommendation but none on doctor's prescription				Percentage of all cases that were attended[3] by any practitioner			
Under $1,200	4.4	4.7	3.4	5.4	66.7	62.0	76.1	66.2
$1,200 But Under $2,000	4.0	4.1	4.1	3.4	74.8	71.1	81.2	74.0
$2,000 But Under $3,000	2.7	2.7	2.3	4.0	80.2	77.8	84.3	79.3
$3,000 But Under $5,000	2.9	2.3	2.7	5.0	81.3	79.3	83.7	82.7
$5,000 and Over	1.0	.6	1.3	1.4	90.1	88.5	91.8	91.1
	Percentage of all cases that had medicine procured only by methods other than doctor's prescription or druggist's recommendation				Total number of attended[3] cases			
Under $1,200	12.9	11.9	14.7	13.3	3,074	1,542	996	529
$1,200 But Under $2,000	12.6	11.6	13.7	13.9	8,017	4,242	2,910	829
$2,000 But Under $3,000	12.6	11.6	14.1	13.5	6,272	3,278	2,204	776
$3,000 But Under $5,000	11.4	10.0	13.6	11.3	3,516	1,644	1,266	584
$5,000 and Over	7.7	7.2	8.7	7.1	4,411	2,017	1,386	982
	Percentage of all cases that had any medicine procured by any method				Total number of all cases			
Under $1,200	53.2	49.5	56.1	60.6	4,609	2,489	1,308	799
$1,200 But Under $2,000	59.2	57.1	61.3	63.6	10,718	5,968	3,584	1,121
$2,000 But Under $3,000	62.1	59.1	66.4	63.7	7,825	4,217	2,614	979
$3,000 But Under $5,000	60.1	55.7	61.6	69.4	4,323	2,072	1,511	706
$5,000 and Over	53.9	51.3	56.9	55.2	4,894	2,279	1,509	1,078

[1]Medicine procured on doctor's prescription includes new and refilled prescriptions and also medicine furnished by the doctor.
[2]All ages includes a few of unknown age.
[3]Attended cases include those attended by medical and nonmedical practitioners, hospitals, and clinics but not cases attended only by a nurse or laboratory attendant.

sistently with income from 67 per cent for families with annual incomes of less than $1,200, to 90 per cent for families with $5,000 or more. The percentage of all cases that had medicine on a doctor's prescription increases up to $3,000 but the two groups above that figure have about the same percentages as the $2,000 to $3,000 income group. The proportion of attended cases with a doctor's prescription shows no consistent variation with income, the highest and lowest income groups having the smallest percentages.

Medicine procured on the recommendation of a druggist was reported more than four times as frequently in the lowest as in the highest income group; the percentages for the intervening classes increase fairly consistently as income decreases. The proportion of cases which had only medicine bought over the counter without a doctor's prescription or a druggist's recommendation was about 13 per cent in the three lower income groups, as compared with 8 per cent for the highest economic class.

Special Services. The proportion of cases with laboratory service of some kind increases regularly from 5.2 per cent in rural unincorporated areas to 10.0 in cities of more than 100,000 population. In each of the three broad age groups shown in Table 10, the percentage of cases with laboratory service increases rather regularly with size of city, the large cities showing about twice as high a percentage of cases with laboratory service as the rural areas.

The proportion of cases with x-ray service also shows a regular increase with size of city, from 2.9 per cent in rural areas to 4.9 for cities over 100,000. In the three age groups, the increase with size of city is just as regular but the relative excess of the large city over the rural areas is not quite as large as for laboratory service.

In rural areas, 1.3 per cent of attended cases had some form of

in cities over 100,000. (b) Rural families with incomes of $5,000 and over had 77 per cent of the cases attended as compared with 91 per cent in cities over 100,000. (c) In each income group there was a fairly consistent increase with urbanization in the percentage of cases attended by a doctor, except that cities over 100,000 showed about the same percentages as cities of 5,000 to 100,000. (d) In each city-size class the percentage of cases attended by a doctor showed fairly consistent increases with the increase in annual family income.

Size of City	All Ages[1]	Under 20	20–44	45 and Over	All Ages[1]	Under 20	20–44	45 and Over
	Number of Cases	Percentage of Attended Cases with Laboratory Service[2]			Number of Cases	Percentage of Attended Cases with X-ray Service[3]		
Cities of 100,000 or Over	962	10.0	7.3	13.3	11.1	470	4.9	3.5	5.9	7.0
Cities 5,000–100,000	544	7.4	5.8	9.5	8.0	266	3.6	2.9	4.1	5.4
Towns Under 5,000	291	5.7	3.3	9.3	5.0	172	3.3	2.6	4.3	3.2
Rural Areas	179	5.2	3.2	7.2	6.9	99	2.9	2.0	3.7	3.7
	Number of Cases	Percentage of Attended Cases with Physiotherapy[4]				Total Number of Attended Cases			
Cities of 100,000 or Over	209	2.2	1.2	2.6	4.6	9,628	4,757	3,393	1,417
Cities 5,000–100,000	110	1.5	1.0	1.2	4.3	7,340	3,797	2,571	952
Towns Under 5,000	80	1.6	1.2	1.9	1.8	5,143	2,577	1,772	774
Rural Areas	45	1.3	.9	1.7	1.6	3,458	1,709	1,115	622

[1]All ages includes a few of unknown age.
[2]One or more kinds of laboratory service (exclusive of x-ray)—*see* Table 6 for specific services included.
[3]X-ray used in the diagnosis or treatment of the case.
[4]One or more kinds of physiotherapy—*see* Table 7 for specific services included.

Table 10. Laboratory, x-ray, and physiotherapy services for illness from all causes in cities of different sizes and in rural areas—8,758 canvassed white families in eighteen States during twelve consecutive months, 1928-1931.

physiotherapy, as compared with 2.2 for cities over 100,000. The three age groups show the same excess for large cities but the intervening city-size classes show rather irregular percentages.

Table 11 shows the percentage of cases with laboratory and x-ray service and physiotherapy among families of different income levels. For all three services there is a clear increase with income in the percentage of attended cases with such services. There is some tendency, however, for the percentages with laboratory and x-ray service to be slightly higher for the under $1,200 income class than for the next higher income group; this tendency is less marked than in the rate of hospitalization (19).

Annual Family Income	All Ages[1]	Under 20	20–44	45 and Over	All Ages[1]	Under 20	20–44	45 and Over
	Number of cases	Percentage of attended cases with laboratory service[2]			Number of cases	Percentage of attended cases with x-ray service[3]		
Under $1,200	203	6.6	4.8	10.2	4.9	110	3.6	2.4	5.0	4.2
$1,200 But Under $2,000	573	7.1	5.4	9.4	8.0	269	3.4	2.3	4.4	5.2
$2,000 But Under $3,000	456	7.3	4.7	11.1	7.0	213	3.4	2.7	4.2	4.1
$3,000 But Under $5,000	276	7.8	4.8	11.0	9.8	133	3.8	2.9	4.6	4.6
$5,000 and Over	452	10.2	8.3	12.6	11.0	273	6.2	5.3	6.6	7.2
	Number of cases	Percentage of attended cases with physiotherapy[4]				Total number of attended cases			
Under $1,200	33	1.1	.9	1.2	1.3	3,074	1,542	996	529
$1,200 But Under $2,000	87	1.1	.8	1.3	1.9	8,017	4,242	2,910	829
$2,000 But Under $3,000	85	1.4	.9	1.3	3.6	6,272	3,278	2,204	776
$3,000 But Under $5,000	86	2.4	1.3	2.9	4.8	3,516	1,644	1,266	584
$5,000 and Over	149	3.4	2.1	3.9	5.1	4,411	2,017	1,386	982

[1]All ages includes a few of unknown age.
[2]One or more kinds of laboratory service (exclusive of x-ray)—*see* Table 6 for specific services included.
[3]X-ray used in the diagnosis or treatment of the case.
[4]One or more kinds of physiotherapy—*see* Table 7 for specific services included.

Table 11. Laboratory, x-ray, and physiotherapy services for illness from all causes among families of different income levels—8,758 canvassed white families in eighteen States during twelve consecutive months, 1928-1931.

Dispensing of Medicine Directly by Physicians

Medicine dispensed directly by a physician was counted in the above tabulations as equivalent to a prescription and, therefore, the cases were combined with those which procured medicine on a doctor's written prescription. However, the schedule indicated the cases for which the medicine was dispensed by the doctor without a special charge for it. Computations have been made of the proportion of cases with a prescription or dispensed medicine in which the medicine was dispensed by the doctor rather than procured on a

written prescription. Of the 13,650 cases with a prescription or dispensed medicine, 3,219, or 23.6 per cent, were cases in which the medicine was dispensed directly by the physician. A patient who had one or more written prescriptions and also medicine dispensed by the doctor would count only as having a written prescription; therefore, this 23.6 per cent of the cases represents a minimum statement of the frequency of dispensing. Also medicine furnished by a large clinic or hospital with a drug department might have been entered on the record as dispensed medicine although the process was more like the prescription method. When hospital and clinic cases are eliminated and the percentage based on cases attended by private practitioners outside of hospitals, 24.3 per cent with doctor's medicine were reported as receiving all doctor's medicine by direct dispensing rather than by written prescription[18]. The corresponding figures for nonhospital clinic cases with doctor's medicine was 23.7 per cent and for hospital cases was 9.5 per cent receiving all doctor's medicine by direct dispensing. In the following tabulations on direct dispensing, hospital and clinic cases are eliminated because of the possible error in the real meaning of dispensing in such cases.

Size of City and Geographic Section. The frequency of the direct dispensing of medicine by the physician varies with size of city and in different geographic regions; Table 12 shows the percentage of cases having doctor's medicine in which all such medicine was received by direct dispensing rather than by written prescription. Considering all geographic sections the proportions with direct dispensing are 11 per cent for cities over 100,000, 16 per cent for 25,000 to 100,000, but 33 per cent or above for the smaller towns and rural areas. The frequency of dispensing increases fairly regularly as size of city decreases except for a high dispensing rate of 63 per cent for industrial towns under 5,000 population as compared with 34 per cent for agricultural towns of the same size. Among families living

[18] Of the cases with medicine from physicians not designated as specialists, 25.4 per cent had medicine directly dispensed by the doctor, as compared with 9.1 per cent for specialists and 8.3 per cent for cases attended by both a physician and a specialist.

in rural unincorporated areas, 47 per cent of the cases with doctor's medicine received it by direct dispensing.

The picture of the variation in the frequency of dispensing with size of city as described above for all regions is generally true for each of the four geographic sections shown in Table 12. Comparing the different sections for cities of given sizes, the South is generally low in dispensing except in industrial towns under 5,000 in popula-

Table 12. Direct dispensing of medicine by physicians in cities of different sizes in four geographic sections[1] — 8,758 canvassed white families in eighteen States during twelve consecutive months, 1928-1931. (Cases with doctor's prescription or doctor's medicine exclusive of all hospital and clinic cases.)

Size of City	Percentage of Cases of Illness With a Prescription or Medicine Furnished by a Doctor in Which All Medicine Was Furnished by a Doctor					Total Number of Cases of Illness With a Prescription or Medicine Furnished by a Doctor				
	All Sections	Northeast[1]	North Central[1]	South[1]	West[1]	All Sections	Northeast[1]	North Central[1]	South[1]	West[1]
All Sizes										
Percentages for All Sizes Combined[2]	24.3	27.3	39.5	7.2	10.7	12,378	2,847	4,577	3,025	1,929
Simple Average of Percentages for Six Sizes[3]	—	37.0	54.2	17.4	14.2	—	—	—	—	—
Cities of 100,000 or Over	11.1	2.3	21.5	1.8	4.7	5,096	1,107	2,242	878	869
Cities 25,000–100,000	16.0	4.0	45.8	2.4	14.1	2,356	327	674	1,171	184
Cities 5,000–25,000	33.0	36.5	47.3	1.6	6.0	1,165	189	649	243	84
Industrial Towns Under 5,000	62.8	75.4	65.5	67.3	31.0	717	175	322	107	113
Agricultural Towns Under 5,000	33.6	48.3	72.9	9.0	14.0	1,498	617	166	301	414
Rural Areas	47.3	55.6	72.1	22.2	15.5	1,546	432	524	325	265

[1]Surveyed States included in each section were as follows: Northeast—New York, Massachusetts, Connecticut. North Central—Illinois, Ohio, Michigan, Indiana, Wisconsin, Minnesota, Kansas. South—District of Columbia, Virginia, West Virginia, Tennessee, Georgia. West—Washington, California, Colorado.

[2]Percentages for all sizes combined are computed by adding the cases in the several size groups and computing a percentage without regard to size.

[3]Simple averages for the six sizes are computed by adding the percentages for the six sizes and dividing by six.

tion. The Northeast and North Central regions both show high dispensing rates for all four classes of places with less than 25,000; in the two classes of cities above 25,000 dispensing is low in the Northeast but much higher in the North Central than in any other section. The West is generally in an intermediate position[19].

Size of City and Income. Since the practice of direct dispensing of medicine by the physician varies with size of city, the data on dispensing to families of different income levels were tabulated by size of city. Table 13 shows for four urban-rural classifications the percentage of cases with a prescription or dispensed medicine in which all doctor's medicine was dispensed directly by the physician. Considering first the change with size of city for given income levels, the percentage of cases in which all doctor's medicine was

[19] Data on the percentage of cases in which doctor's medicine was directly dispensed were also tabulated for individual States using three city-size classifications: (a) cities over 25,000, (b) industrial towns and cities under 25,000 population, and (c) agricultural towns under 5,000 and rural areas. In the following summary the percentages for each State are compared with the median for the twelve to sixteen States with available data for places of the same city-size category. The median percentages with dispensed medicine for all States were as follows: cities over 25,000—4.5, industrial towns and cities under 25,000—25.9, agricultural towns under 5,000 and rural areas—25.5 per cent.

Of the seven surveyed States in the North Central region, Indiana, Ohio, Michigan, and Wisconsin were high in all city-size categories with available data, as compared with median percentages for cities of the same class in all surveyed States. Kansas and Minnesota each have data available for only two city-sizes and each shows one category above and one below the general median for the same city-size class. Illinois is slightly below the median in the one city-size (over 25,000) for which data are available.

All three surveyed States in the Northeast had percentages with dispensed medicine in cities over 25,000 that were below the median for cities of the same size in all States. New York was the only State with data for the other two city-size categories and in both sizes the percentages were definitely above the median.

In the five surveyed Southern States the percentages with dispensed medicine were below the median for cities of the same size in all States for all categories with available data except industrial towns and cities under 25,000 in West Virginia. In Tennessee the percentages for the two available city-size categories were only slightly below the median.

In all three surveyed States in the West, the percentages with dispensed medicine were above the median in cities over 25,000. In California, the percentage dispensed for industrial towns and cities under 25,000 was also above the median. All three States were below the median in agricultural towns and rural areas but the percentage for Colorado was only slightly below the median.

The numbers of cases with doctor's medicine by prescription or dispensing (on which these percentages are based) run as low as 57 but the majority of the percentages are based on more than 100 cases. Because of these fairly small numbers and the fact that the surveyed families living in communities of a given size may not be representative of such places in a particular State, only very general statements can be made about State to State variations in dispensing.

dispensed directly by the physician increases fairly regularly in each income group as size of city decreases.

Table 13. Direct dispensing of medicine to families of different annual income levels in cities of various sizes—8,758 canvassed white families in eighteen States during twelve consecutive months, 1928-1931. (Cases with doctor's prescription or doctor's medicine exclusive of all hospital and clinic cases.)

Size of City	All Incomes[1]		Under $1,200	$1,200 But Under $2,000	$2,000 But Under $3,000	$3,000 But Under $5,000	$5,000 or Over
	Percentage for All Incomes Combined[2]	Simple Average of Percentages for Five Incomes[3]	Percentage of cases of illness with a prescription or medicine furnished by a doctor in which all medicine was furnished by a doctor				
All Sizes							
Percentage for All Sizes Combined[4]	24.3	—	42.3	28.6	22.3	16.3	13.3
Simple Average of Percentages for Five Sizes[5]	—	—	37.3	32.8	29.4	24.0	21.2
Cities of 100,000 or Over	11.1	11.3	13.7	13.0	10.9	7.1	11.7
Cities 25,000–100,000	16.0	15.7	19.4	19.3	18.1	16.4	5.2
Cities 5,000–25,000	33.0	32.4	49.3	40.6	29.2	23.1	19.8
Towns Under 5,000	43.1	40.4	52.8	45.0	41.1	29.8	33.3
Rural Areas	47.3	44.9	51.4	46.1	47.4	43.4	35.9
	Total number of cases of illness with a prescription or medicine furnished by a doctor						
All Sizes	12,378		1,356	3,992	3,256	1,716	1,957
Cities of 100,000 or Over	5,096		212	1,443	1,388	905	1,133
Cities 25,000–100,000	2,356		144	711	784	275	424
Cities 5,000–25,000	1,165		134	409	260	143	217
Towns Under 5,000	2,215		428	820	552	248	144
Rural Areas	1,546		438	609	272	145	39

[1] All incomes includes a few of unknown income.
[2] Percentages for all incomes combined are computed by adding the cases in the several income groups and computing a percentage without regard to income.
[3] Simple averages for the five incomes are computed by adding the percentages for the five income groups and dividing by five.
[4] Percentages for all sizes combined are computed by adding the cases in the several size groups and computing a percentage without regard to size.
[5] Simple averages for the five sizes are computed by adding the percentages for the five sizes and dividing by five.

There is also a fairly consistent increase in dispensing as family income decreases, at least in small towns and rural areas. In cities over 100,000, there is no consistent change with income, and the income differences are small for cities from 25,000 to 100,000 with the exception of a low figure for the highest income group. In the two groups of towns under 25,000 in population and also in rural areas, the low family income levels have definitely more direct dispensing than the higher levels. If a simple average of the percentages for the five urban-rural groups in each income level is computed, the resulting mean percentages of cases in which doctor's medicine was dispensed directly by the physician range from 21 for family incomes above $5,000 to 37 per cent for those under $1,200 per year. Thus the lowest income group in these "adjusted" percentages shows less than twice the dispensing percentage of the highest, but rural areas show about four times as much dispensing as cities over 100,000. The averaging of the percentages for the different income levels gives "adjusted" figures for the variation with size of city that are about the same as the simple percentages quoted earlier.

Summary

Data on the frequency of illness, the purchase of medicine by prescription and other methods, and the use of laboratory and other special services were recorded for a twelve-month period between 1928 and 1931 by periodic canvasses of 8,758 white families in 130 localities in eighteen States. The surveyed families include representation from nearly all geographic sections; from rural, urban, and metropolitan areas; from all income classes; and of both native and foreign-born persons. Visits were made at intervals of two to four months and all illness that caused symptoms for one day or longer were recorded.

There were 495 illnesses per 1,000 population for which some medicine was procured for the specific attack; this represents 58 per cent of all illnesses reported in the survey.

There were 368 illnesses per 1,000 population for which some medicine was procured by a doctor's prescription, either new or refilled (including medicine dispensed directly by a physician); 27 cases per 1,000 purchased medicine on a druggist's recommendation, and the other 100 cases per 1,000 had only medicine purchased without a doctor's prescription or a druggist's recommendation. Of the total cases, 43 per cent procured medicine on a prescription and of the attended cases 53 per cent had prescription medicine.

Women reported an excess over men in cases with medicine per 1,000 population, but there was very little excess in the *percentage* of cases with medicine; thus the excess in cases represents more illness among women rather than more medicine for the illnesses that occurred.

Laboratory service was more frequent among women than men in both cases per 1,000 and the percentage of cases with service. However, a considerable part of the excess was due to female genital and puerperal diagnoses.

Degenerative diseases and nervous diseases were the two broad groups which had the highest percentages with medicine procured on prescription. Of cases attended by a doctor, minor respiratory and minor digestive diseases had the highest percentages with prescriptions.

Of all cases with prescriptions, 37.4 per cent were minor respiratory diseases, 9.4 per cent communicable, and 8.6 per cent minor digestive diseases.

Of the broad diagnosis groups, accidents showed the highest percentage of cases with some x-ray service, but of specific diagnoses, cancer showed the highest percentage. Of all cases with any x-ray service, accidents constituted 37 per cent.

Urinalysis was by far the most frequent type of laboratory service, blood tests except for syphilis were second, and Wassermann or other syphilis tests were third in frequency.

The percentage of cases attended by a doctor and the proportion

of all and of attended cases that procured medicine by prescription were all larger in cities than in rural areas. The frequency of laboratory and of x-ray service increased with size of city and with family income.

The practice of the direct dispensing of medicine by physicians is much more common in small cities, towns, and rural areas than in cities over 25,000 in population. The practice is also more frequent in the low than in the higher family income levels.

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ANNOTATIONS

THE SCIENCE OF NUTRITION[1]

In writing The Science of Nutrition, Professor Sherman has added a timely, interesting book to the series of authoritative books which he has authored and which are so well known to students of nutrition. In this latest book, Professor Sherman has accomplished the difficult task of giving a sound, concise summary of the present-day science of nutrition and of interpreting the large amount of laboratory evidence on the value of improved diets for better physical and mental health. To the fullest extent possible, Professor Sherman has avoided using technical terms, but this book is no primer about nutrition. It should find favor with a large audience of readers who want to understand the facts about foods and dietary requirements and to have sufficient information to think intelligently about national and international policies in the making today which will affect our food supplies and those in many other countries.

In the first seven chapters, specific food factors are discussed. Present-day concepts of the functions of each of the major food elements, together with a brief historical statement on the development of these concepts, are summarized. Effects on the body of deficiencies of specific nutrients are mentioned, chiefly as evidence on the function and physiological behavior of the nutrients, but here and elsewhere in the book the clinical and pathological aspects of malnutrition are touched on very lightly. The dynamic aspects and physico-chemical reactions which characterize nutritional processes in the body are described in Chapter VIII, "How the Body Manages its Nutritional Resources." Here are presented the findings of some of the isotope experiments which have contributed so greatly to recent thought on the nutritional process.

For most of the remainder of the book, Professor Sherman is con-

[1]Sherman, Henry C.: The Science of Nutrition, New York, Columbia University Press. 1943, 253 pp. $2.75.

cerned with the problem of making our knowledge of nutrition an effective tool for improving human life and with discussing the benefits which laboratory experiments have shown can reasonably be expected from an optimal diet. Nutritional improvement of any population is a matter of foods, and Professor Sherman translates the previously discussed knowledge of nutrient requirements into the need for various food groups. Different methods of budgeting a good diet are presented for use in educational activities. Although improvement in individual food habits is primary for better nutrition, Professor Sherman considers national or governmental policies which may affect food consumption. The possibilities and responsibility of the government to improve the national diet are especially evident under present war conditions.

From his long experience in laboratory research on animal nutrition, Professor Sherman is unusually well qualified to interpret such research as to its significance for the benfits to human life to be expected from nutritional improvements. This he has done clearly and effectively in the final chapter, entitled "Scientific Critique of the 'Offer' of Higher Health and Longer Life." As Professor Sherman points out, there is no longer any doubt that certain diseases are due to shortages of normal nutrients, but it is more difficult to gain general understanding and acceptance of the "positive or constructive aspect of the new concept" of nutrition. The evidence for and meaning of the constructive aspect "which relates nutrition to superior health which we thought was attributable to heredity, or original good luck in chromosomal endowment, or to 'natural constitution' " are concisely presented. Professor Sherman has assembled an impressive amount of data to show the value of better than average nutrition and this book is recommended to all who want to know why it is important to eat the right kinds of foods even though they now enjoy good health.

DOROTHY G. WIEHL

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THE CONQUEST OF EPIDEMIC DISEASE[1]

THE number of books on epidemiology published during the last decade is very limited and the history of this field has hardly been

[1]Winslow, Charles-Edward A.: THE CONQUEST OF EPIDEMIC DISEASE, Princeton, Princeton University Press, 1943. 411 pp. $4.50 cloth.

treated at all. While it is true that there is no scarcity of books treating particular contagious diseases from a historical point or view, either in the form of scientific monographs or in a more popular form, no writer seems, in modern time, to have written a book dealing with the evolution of the theories regarding the occurrence of epidemic disease. Professor Winslow's book will therefore be welcomed by students of epidemiology.

It covers the history of the "Great Plagues" from antiquity up to modern times and discusses particularly the history of the concept of infection. Three introductory chapters deal with the problem of human thought and the use of generally held concepts in primitive medicine. Professor Winslow finds that there are three main norms of human thought in this field, the Demonic theory, the "Wrath of God" theory, and what he calls the metaphysical theory, using this word as meaning the science of the supersensible. All three ideologies may still be found working today, at different intellectual levels of the population, he points out, and a more rigid scientific investigation may detect traces of all of them even in the same individual.

In the following chapters human endeavor to establish the cause of epidemic disease is treated. Hippocrates' "Air, Water and Places" is described and its importance discussed. After a discussion of Galen's contribution to this field follows a chapter on primitive concepts of contagion in which an interesting comparision is made between the medical philosophy of the Old and the New Testament. Plague is described as the "Great Teacher" and the early history of quarantine is given together with an extensive discussion of the earliest plague pamphlets. A very clear and penetrating study is made of Fracastorius' "De Contagione." Professor Winslow comes to the conclusion that Fracastorius thought of the "germ" "not as living organisms, but as chemical substances," a view somewhat different from the one held by Singer and Goodall. A description of Kirscher's work is interesting as it, in Professor Winslow's words, was: "the first really effective presentation of the theory that living organisms were the primary cause of disease." Professor Winslow's chapter on Sydenham and the later chapter on Pettenkofer must be judged from the particular angle from which the book is written. Professor Winslow's personal interest has been chiefly in the pragmatic aspect of epidemiology and as a pragmatic epidemiologist he has little use for the theories of Sydenham and Pettenkofer, and thus we find no mention of the modern, chiefly German, school of Geo-

medicine, which, particularly under the leadership of Zeiss, has revived the interest in this aspect of epidemiological theory.

Dr. Mead's "Discourse" on how to avoid a repetition of the Marseilles disaster in London is given in considerable detail. A chapter is devoted to yellow fever, dealing particularly with the work of Rush and Noah Webster. The importance of the sanitary awakening is emphasized in a special chapter and the work of the three great pioneer epidemiologists, Panum, Budd, and Snow, is analyzed. A following chapter is devoted to the work of Pasteur and Koch with regard to the theory of contagion. The "carrier" concept is discussed and a special chapter is devoted to insect transmission of disease.

The final chapter discusses Chapin's "Source and Modes of Infection" and Professor Winslow concludes that only in one respect have the studies of the last twenty years indicated a real modification of Chapin's viewpoint. This is in regard to the importance of aerial dissemination of infection.

Professor Winslow's book should prove useful to the medical student wanting a somewhat wider background for his studies in bacteriology and epidemiology than the average textbook will give him. The public health officer will also find much of interest to him here and the book might be of great use to him during his graduate studies.

ARNE BARKHUUS

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MANUAL OF INDUSTRIAL HYGIENE[1]

THE need for trained personnel to furnish industrial hygiene services has been greatly intensified by the war production program. Not only have many new physicians, engineers, and nurses been called into industrial service but many experienced personnel already in the field have had to cope with new problems as a result of the conversion of plants to war purposes. A MANUAL OF INDUSTRIAL HYGIENE and Medical Service in War Industries has been prepared, therefore, by the Division of Industrial Hygiene of the National Institute of Health to describe

[1] MANUAL OF INDUSTRIAL HYGIENE and Medical Service in War Industries: Issued under the Auspices of the Committee on Industrial Medicine of the Division of Medical Sciences of the National Research Council. Prepared by the Division of Industrial Hygiene, National Institute of Health, United States Public Health Service. A Composite Book with 16 Contributors. Edited by William M. Gafafer, D.Sc. 508 pages with 20 illustrations. Philadelphia and London, W. B. Saunders Company, 1943. $3.00.

approved programs and policies and to make available in one book the essential subject matter in the industrial hygiene field. This Manual should prove extremely useful to all who are working on any of the health problems of war workers.

The Manual is in three parts. Part I deals with Organization and Operation of Facilities, and includes eight chapters. The authors make explicit and practical suggestions concerning such matters as the planning of the physical set-up of the facilities, the specific medical, dental, and nursing services to be furnished, the relationships with management and labor, and the integration of plant hygiene service with those in the community and the use of special services available from the State or Federal Government. Part II is on Prevention and Control of Disease in Industry. The thirteen chapters in Part II cover a wide range of subjects as may be indicated by selected chapter titles, as follows: The Problem of Occupational Disease, in which legal aspects of compensation and liability are briefly discussed, although most of the space is given to clinical descriptions of the principal industrial diseases with recommendations for their treatment and prevention; Engineering Control of Air Contamination of the Working Environment; Industrial Psychiatry; Health Education; Nutrition in Industry; Community Sanitation; Plant Sanitation; and Illumination, Noise and Radiant Energy. In Part III, The Manpower Problem, there is a discussion of the placement of handicapped workers in industry and of the various problems connected with the employment of women. The final chapter presents data on absenteeism because of sickness. The frequency of absences according to durations and according to causes of sickness are shown; and the relation of sex, age, season, and certain other factors to absenteeism is discussed.

The sixteen authors of this handbook have condensed a vast amount of information into a compact reference book. Most chapters include an extensive bibliography and the book as a whole is well indexed.

DOROTHY G. WIEHL

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PREVENTING WAR-TIME SPREAD OF TUBERCULOSIS

THE increase in tuberculosis mortality already noted in Great Britain and throughout Europe since the war and the threat of a similar increase in this country have made it urgent that measures be taken to

prevent the war-time spread of tuberculosis. The Committee on Tuberculosis in War-Time[1] has set forth specific recommendations for dealing with the problem in Great Britain. In this country Dr. H. E. Hilleboe[2] has outlined certain measures to be put into effect based on the objectives of the Tuberculosis Control Section of the States Relations Division of the United States Public Health Service.

Both programs emphasize the need for mass chest x-ray examinations by use of the small film technique. This technique has an advantage over the standard x-ray procedure as a method of case finding in that it provides greater speed and economy of examination without any significant loss of accuracy in detecting cases. In the United States, where a chest x-ray is already included in the physical examination for entry into the Army and Navy, Hilleboe urges that the x-ray be extended also to all members of the Coast Guard and Merchant Marine and that it be used on a large scale among war workers and their families. The British report recommends mass radiography for those about to enter the three Services, for those entering new employment in industry, and for selected employment groups such as munitions workers. The British Committee suggests periodic chest x-ray examinations for important manpower groups known to be at particular risk to tuberculosis.

Both reports recognize the need for adequate treatment of tuberculosis cases after they are discovered. Better use of existing hospital facilities is suggested by Hilleboe. The British Committee proposes a possible allocation of more hospital beds to tuberculosis, the use of convalescent homes as sanatoria for cases requiring relatively short hospitalization, and the use of wider powers to obtain staff should appeals for recruits prove unsuccessful. Both studies emphasize the importance of industrial rehabilitation of the tuberculous patient after treatment. An additional and necessary factor in the treatment of the tuberculous patient which the British report discusses is the provision of financial assistance. It is pointed out that financial aid may be needed not only for treatment but in order to prevent a return to work before recovery is complete or to prevent a lowering of the standard of living of the patient and his family during the long period of convalescence. Measures to provide financial assistance should be included in every tuberculosis control program.

[1]Report of the Committee on Tuberculosis in War-Time. London, Medical Research Council, 1942.

[2]Hilleboe, Herman E.: Opportunities in the Newer Methods of Tuberculosis Case Finding. *Public Health Reports,* July 16, 1943, 58, No. 29, pp. 1094-1101.

Another important point which is included in the British program and not mentioned in the American is the effort to raise general resistance to tuberculosis, especially among groups considered to be more susceptible to tuberculosis than others, by "the maintenance of good nutrition, favorable working conditions, the avoidance of fatigue caused by over-long working hours, and mitigation of domestic crowding."

The problem of reducing the spread of bovine infection, which is discussed in the British report, is not considered by Dr. Hilleboe because measures of control of tuberculosis in cattle have already been put into effect in this country. The British Committee recommends measures for the pasteurization and hygienic production of milk. When pasteurization is not possible it is recommended that instructions be given for boiling the milk or that dried milk be used.

Additional measures suggested by the British Committee are: (1) examination of contacts, (2) periodic x-ray of patients in mental hospitals and institutions for mental defectives, (3) health education and propaganda both for medical practitioners and the general public, and (4) reorganization of the tuberculosis services.

Dr. Hilleboe's program also calls attention to the need for examinations in mental hospitals. He suggests routine chest x-rays for patients on admission to mental hospitals and also to general hospitals. In addition, his recommendations include the establishment of an efficient record system for follow-up of cases discovered among rejected recruits and industrial workers and the establishment of workable procedures with the Selective Service System for follow-up care of tuberculosis cases among rejected recruits. Dr. Hilleboe also urges the reorganization of tuberculosis services on a war-time basis; he calls for energetic and immediate action by all agencies in carrying out a program, stripped of all nonessentials, which will reach the greatest number of essential workers and their families in the shortest possible time.

The war-time spread of tuberculosis is already a reality in Great Britain, and for that reason the British report offers somewhat more specific and more detailed recommendations than those of the Public Health Service presented by Dr. Hilleboe. The British report also includes a discussion of the general trend of tuberculosis mortality from 1939-1941 and of factors which might be responsible for the increase in tuberculosis mortality.

Both reports contain important recommendations and should be ex-

tremely valuable to tuberculosis services in revising their programs to meet war-time demands.

SALLY PREAS

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HOSPITAL DISCHARGE STUDY:[1] VOL. II

SURGICAL cases make up a large part of the total hospital case load in terms of admissions, and a considerable proportion of the surgery is elective in nature. Therefore hospital admission rates mean much more when they are for specific causes.

In the New York Hospital Discharge Study the records covered nearly all hospitals; thus rates for New York City and various districts of New York could be computed by age, sex, and color. The fact that a population was available made the New York Study different from nearly all other hospital studies for few have a population available.

An important point of view of the authors in presenting the data in this second volume was the distribution of the hospital case load as between voluntary and municipal hospitals and as between general and special hospitals and institutions for the chronically sick. Thus, for a considerable number of specific diagnoses there is set forth the distribution of cases according to these types of hospitals. In further pages are comparisons of different hospitals according to the days of hospital care, in terms of about five categories of length of hospital stay; no figures are given for average stay in the hospital or days of hospital care per 1,000 population.

An early chapter takes up surgical services in hospitals, showing for specific diagnoses the percentages that were treated surgically, the type and size of hospitals to which surgical cases were most frequently sent, the stay in the hospital for nonfatal and fatal surgical and nonsurgical cases. Following are chapters on appendicitis and tonsil conditions, a large proportion of both diagnoses being treated surgically. The percentage of hospital cases that ended fatally, computed separately for surgical and nonsurgical cases, is used in these and other chapters throughout the report.

Other chapters show similar items about important causes of hospital

[1]Deardorff, Neva and Fraenkel, Marta: HOSPITAL DISCHARGE STUDY, An Analysis of 576,623 Patients Discharged from Hospitals in New York City in 1933. Vol. II. Hospitalized Illness in New York City. New York, Welfare Council of New York City.

care, including obstetrical cases, traumatisms and poisonings, communicable diseases, pneumonia, venereal diseases, tuberculosis, malignant and nonmalignant neoplasms, diabetes, rheumatic and arthritic conditions, cardiovascular diseases, and miscellaneous other acute and chronic diseases. Of these categories, the chapters on obstetrical cases and tuberculosis are the most complete. The chapter on obstetrical cases includes data on the type of birth (spontaneous, forceps, or cesarean), whether full-term or premature, and complications, along with other factors. The chapter on tuberculosis shows not only cases and percentages, but rates per 100,000 for reported cases, deaths, and hospital discharges for each of thirty-one health center districts of New York City. Diabetes and cancer are also treated quite fully but with less use of rates than of percentage distributions.

In general this second volume is written from the point of view of the characteristics of hospitalized cases rather than the extent or frequency of such cases as judged by the rate per 1,000 population. While the first volume had numerous rates in it, one cannot help but feel that more frequent use of rates per 1,000 would have been worth while in the detailed chapters on these specific diseases. However, the numbers of cases are set forth in considerable detail, so they can be used by other investigators in computing any rates or percentages not included in these reports.

The characteristics of the cases which are set forth for the specific diseases mentioned above are: (a) age, sex, and color distribution in percentages of cases and sometimes in specific rates per 1,000, (b) distribution of cases and frequency rates per 1,000 for the thirty-one health center districts, (c) case fatality or the proportion of cases discharged from the hospital as dead, (d) length of hospital stay, and for some diseases (e) rates by race stock or country of origin.

This second volume, like the first, contains a mass of detailed information about hospitalized illness which is of interest to students of hospital morbidity and which should be useful in many ways in present planning for hospital care in postwar years.

SELWYN D. COLLINS

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TO TITLES OF ARTICLES AND AUTHORS IN THE MILBANK MEMORIAL FUND QUARTERLY

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